TM 11-5825-203-20

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

Sec C 2,3,4,5

TECHNICAL DATA

ORGANIZATIONAL MAINTENANCE MANUAL

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RECEIVER GROUP OA-1451/PRR

R-744

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HEADQUARTERS, DEPARTMENT OF THE ARMY
10 APRIL 1961

WARNING

DANGEROUS VOLTAGES EXIST IN THIS EQUIPMENT

Be careful when connecting cables
or working inside the receiver or
power supply.

DON'T TAKE CHANCES!

TM 11-5825-203-20
C 6

CHANGE
No. 6

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, DC, *29 August 1975*

Organizational Maintenance Manual
RECEIVER GROUP OA-1451/PRR, OA-1451A/PRR, AND OA-1451B/PRR

TM 11-5825-203-20, 10 April 1961, is changed as follows:

The title is changed as shown above.

Page 2. Paragraph 1.1 is superseded as follows:

1.1. Indexes of Publications

a. DA Pam 310-4. Refer to the latest issue of DA Pam 310-4 to determine whether there are new editions, changes, or additional publications pertaining to the equipment.

b. DA Pam 310-7. Refer to DA Pam 310-7 to determine whether there are modification work orders (MWO's) pertaining ot the equipment.

Paragraph 2 is superseded as follows:

2. Forms and Records

a. Reports of Maintenance and Unsatisfactory Equipment. Maintenance forms, records, and reports which are to be used by maintenance personnel at all maintenance levels are listed and prescribed by TM 38-750.

b. Report of Packaging and Handling Deficiencies. Fill out and forward DD Form 6 (Report of Packaging and Handling Deficiencies) as prescribed in AR 700-58 and DSR 4145.8.

c. Discrepancy in Shipment Report (DISREP) (SF 361). Fill out and forward Discrepancy in Shipment Report (DISREP) (SF 361) as prescribed in AR 55-38 and DSR 4500.15.

Paragraphs 2.1, 2.2, and 2.3 are added after paragraph 2.

2.1. Reporting of Errors

The reporting of errors, omissions, and recommendations for improving this publication by the individual user is encouraged. Reports should be submitted on DA Form 2028 (Recommended Changes to Publications and Blank Forms) and forwarded direct to Commander, US Army Electronics Command, ATTN: AMSEL-MA-Q, Fort Monmouth, NJ 07703.

2.2. Administrative Storage

For procedures, forms, and records, and inspections required during administrative storage of this equipment, refer to TM 740-90-1.

2.3. Destruction of Army Materiel

Destruction of Army materiel to prevent enemy use shall be as prescribed in TM 750-244-2.

Page 6. Paragraphs 6.1 and 6.2 and figures 3.1 and 3.2 are added after paragraph 6.

6.1. Radio Receiver R-744B/PRR Controls and Indicators

(fig. 3.2)

Controls or indicator	*Function*
MEGACYCLES dial	Indicates frequency to which receiver is tuned.
CAL ADJ control	Adjusts position of tuning indicator to calibrate MEGACYCLES dial.
TUNING control	Tunes receiver to desired frequency.
DIAL LOCK	Locks TUNING control.
VEH POWER receptacle	Connector for vehicular power source.
POWER switch:	
BATT	Receiver operates from internal batteries.
OFF	Turns receiver off.
VEH	Receiver operates from vehicular electrical system.
DF ANT connector	Connector for direction finder antenna.
Antenna selector switch	Connects whip attenna or direction finder antenna to receiver input.
ANT connector	Connector for whip antenna.

Controls or indicator	*Function*
AF GAIN control	Controls volume to the headset.
AUDIO jack	Connector for headset.
LITE DIM control	Controls illumination of MEGACYCLES dial.
OPERATE switch:	
FM	Permits reception of fm signals.
AM	Permits reception of am. signals.
CW	Permits reception of cw signals.
CAL	Provides calibration signals for check or adjustment of MEGACYCLES dial. **NOTE** Be sure that all antennas are disconnected from the receiver when the OPERATE switch is in CAL POSITION.
METER switch:	
SIG	Meter indicates relative strength of received signal.
1.5V	Meter measures filament supply voltage.
45V	Meter measures plate supply voltage.
Meter	Indicates voltage determined by setting of METER switch.
DIODE OUTPUT	Connector for transmission cable to Azimuth Indicator IP-740/GR.
RF GAIN control	Controls sensitivity of the receiver.
LITE (dial lamp)	Illuminates the MEGACYCLES dial.

6.2. Description, Radio Receiver R-744B/PRR

(fig. 3.1)

The R-744B/PRR receiver is a shock-mounted vehicular or portable radio receiver which is continuously tunable over a frequency range from 20 MHz to 100 MHz. The receiver provides reception of cw, am., and fm signals. All operating controls and connectors are located on the front panel. When used in the shelter mode of operation, vehicular power is transmitted through a cable to the front panel VEH POWER receptacle. When the R-744B/PRR is removed from the shelter during man-portable operation, power is supplied by self-contained batteries. Access to batteries is provided by a removable panel at each end of cover assembly. The R-744B/PRR has direction-finding capability with the addition of diode module U209.

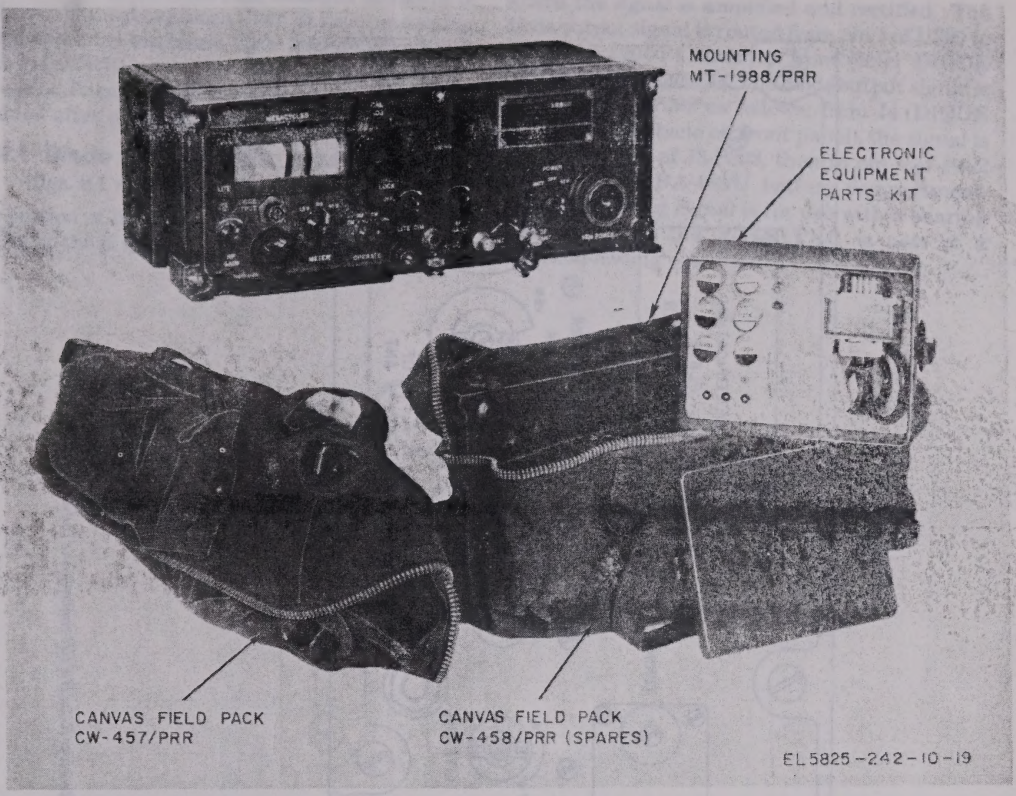


Figure 3.1. Radio Receiver R-744B/PRR.

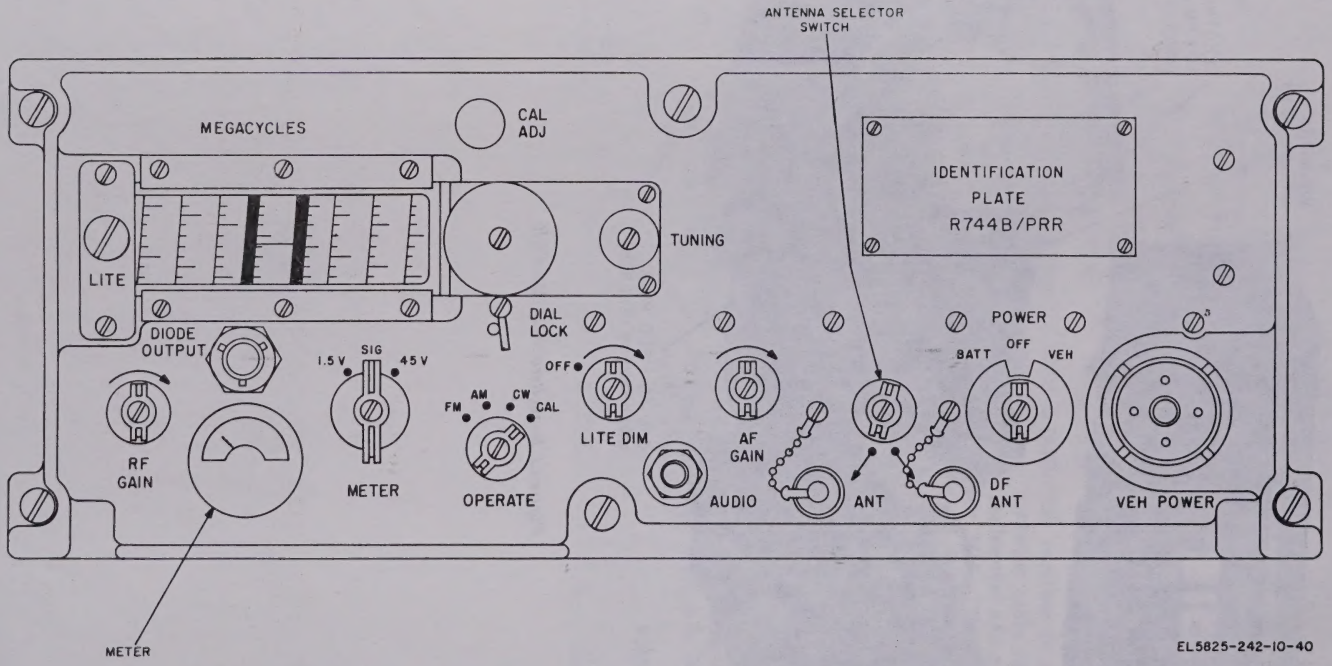


Figure 3.2. Radio Receiver R-744B/PRR controls and indicators.

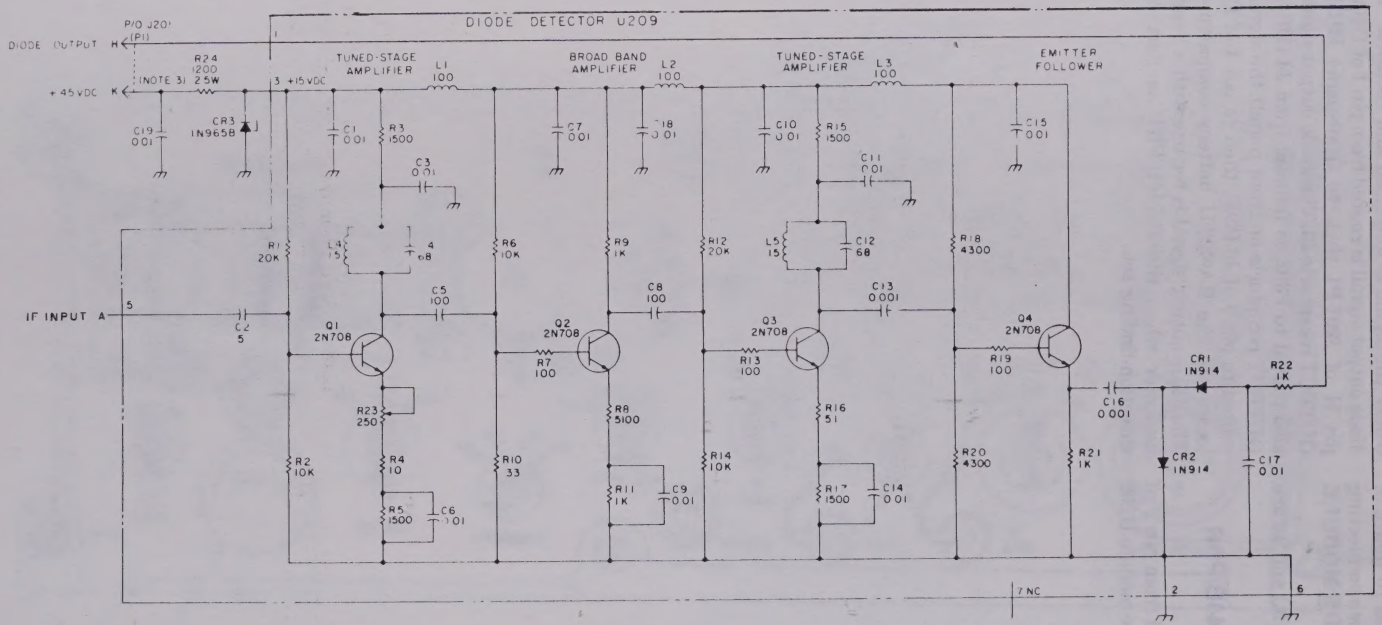
Page 9. Make the following changes to figure 5: Draw a block above block U203, draw a connecting line and label top block, U209 DIODE MODULE (R-744B/PRR).

Page 14. Paragraph 14.1 and figures 9.1 and 9.2 are added after paragraph 14.

14.1. Diode Module U209, R-744B/PRR

(figs. 9.1 and 9.2)

A portion of the if. signal is routed from pin 2 of U203 to the if. input on pin 5 of diode module U209 where the signal is amplified and rectified. The diode output signal is routed from pin 1 of U209 to pin H of J201-P1 then to front-panel DIODE OUTPUT receptacle J4. The diode output signal is also routed to P302 as follows: from J4 (DIODE OUTPUT receptacle on front panel), the signal is routed to pin 9 of J3-P303, then to pin 4 of P302 located in the BA-403/U battery compartment. The diode output signal is for use with a bearing indicator when the R-744B/PRR is part of a direction-finding set.



NOTES

1. UNLESS OTHERWISE INDICATED, RESISTANCES ARE IN OHMS, CAPACITANCES ARE IN UUF, INDUCTANCES ARE IN UH
2. CONNECTORS VIEWED FROM PIN OR RECEPTACLE SIDE
3. PIN 4 OF X209 USED AS TIE POINT FOR JUNCTION OF C19 & R24 (+45VDC)

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Figure 9.1. Radio Receiver R-744B/PRR, diode module U209, schematic diagram.

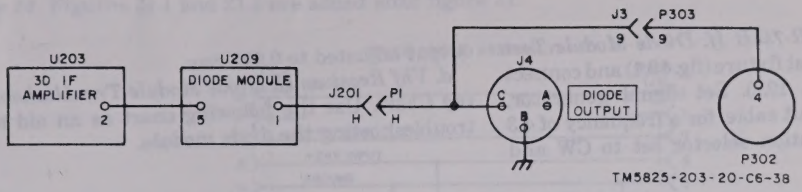


Figure 9.2. Diode output block diagram, R-744B/PRR.

Page 15. Make the following changes to figure 10: From terminal 2 of if. amplifier U203, draw a line and label, TO PIN 5 of U209.

Add the following note:

3. Corrections to U203 If. Amplifier apply to R-744B/PRR.

Page 16. Figure 11.1 is added after figure 11.

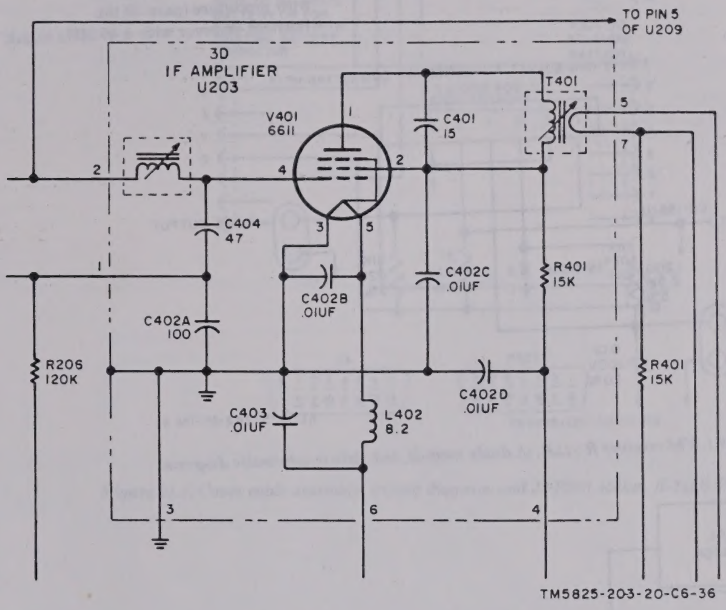


Figure 11.1. If. amplifier U203, schematic diagram, R-744B/PRR.

Page 20. Subparagraph *c* is added after paragraph 19*b*.

c. On the R-744B/PRR auxiliary audio output is routed from AUDIO jack J5 to pin 10 of J3-P303 then to pin 5 of P302 in BA-403/U battery compartment.

Page 34. Paragraph 36.1 and figures 19.1 and 19.2 are added after paragraph 36.

36.1. Vhf Receiver R-744B/PRR If. Diode Module Troubleshooting

(fig. 19.1)

a. Equipment Required. Refer to paragraph 39.1 for equipment requirements.

b. Vhf Receiver R-744B/PRR If. Diode Module Short Circuit Test. Remove cover and test for short circuit in accordance with the chart below. Refer to paragraph 50 for receiver removal-replacement procedures.

Point of measurement	*Normal indication*	*Isolating procedure*
Between plug P1, pin K, and chassis ground.	9,000 ohms	If indication if lower than normal, check for short across capacitor C19, diode CR3, and capacitor C1, C7, C18, C10, or C15.

c. Vhf Receiver R-744B If. Diode Module Test Setup. Fabricate test fixture (fig. 19.1) and connect diode module (fig. 19.2). Set signal generator, connected to if. input cable, for a frequency of 4.3 MHz, with modulation selector set to CW and output adjusted to 0.005 rms.

d. Vhf Receiver If. Diode Module Troubleshooting Chart. Use the following chart as an aid to troubleshooting the diode module.

Symptom	*Probable cause*	*Checks and corrective measures*
No diode output control.	Faulty potentiometer.	Check potentiometer R23 in tuned stage amplifier.
No diode output.	Faulty stage of diode module.	Refer to figure 9.1 and test diode module in accordance with procedure (para 39.1*b*). Recheck receiver with a 40-MHz input.

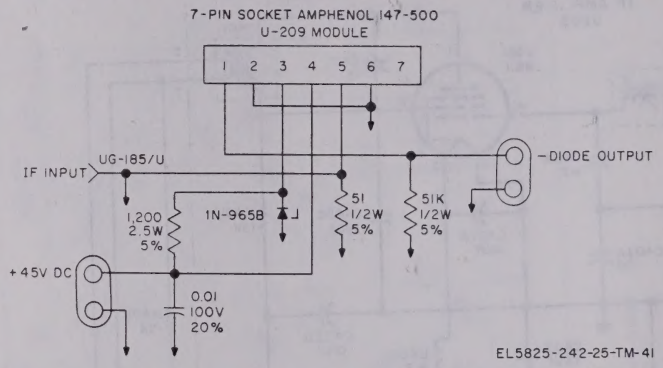


Figure 19.1. Vhf receiver R-744B, if. diode module, test fixture schematic diagram.

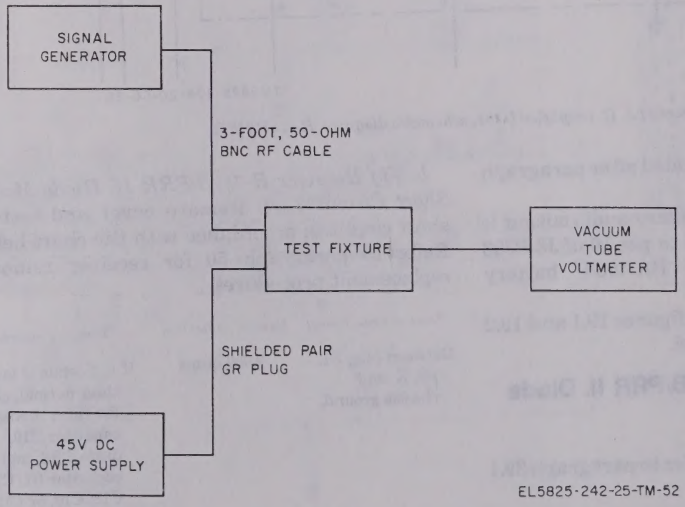


Figure 19.2. Vhf receiver, R-744B, if. diode module, test connection diagram.

Page 36. Figures 21.1 and 21.2 are added after figure 21.

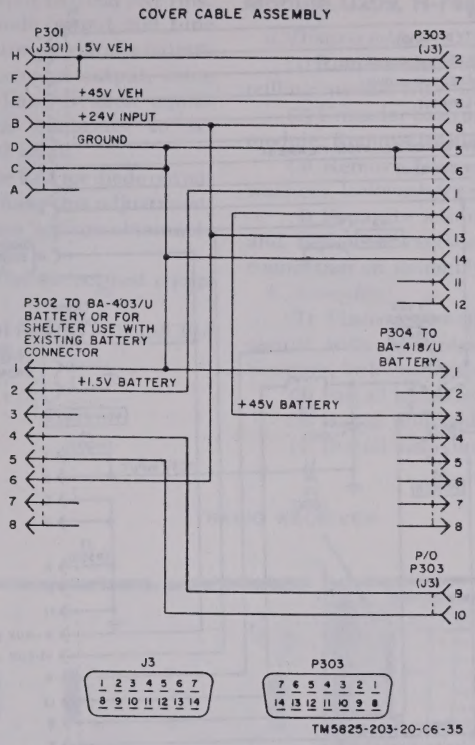


Figure 21.1. Cover cable assembly, wiring diagram and J3-P303 socket, R-744B/PRR.

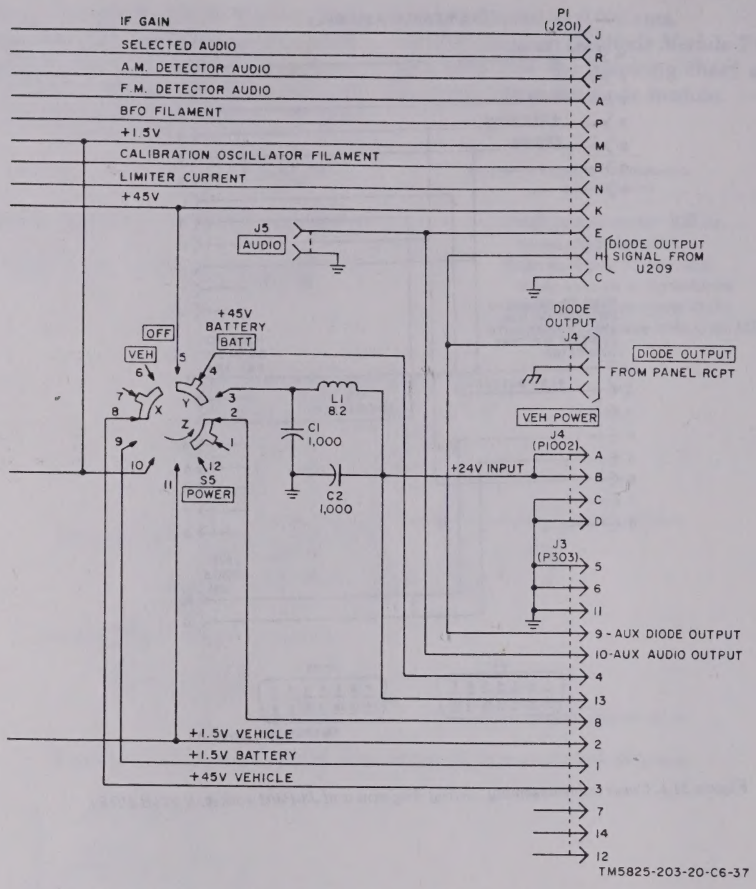


Figure 21.2. Wiring diagram, J201-P1, J4, and J3-P303, R-744B/PRR.

Page 39. The following sentence is added to subparagraph 39c(3): On the R-744B/PRR, check for audio signal on pin 5 of P302 in the BA-403/U battery compartment.

Page 43. Add paragraph 39.1 after paragraph 39.

39.1. Vhf Receiver R-744B If. Diode Module Test

a. Equipment Required.

(1) Signal Generator, RF AN/URM-25, or equivalent.

(2) 45-Volt DC Power Supply, Power Design 3650S, or equivalent.

(3) Electronic Voltmeter ME-26A/U, or equivalent.

(4) Test Fixture TF-830/13, or equivalent (fig. 19.1).

b. Test Procedure.

(1) Be sure all power is off.

(2) Fabricate test fixture in accordance with test fixture schematic diagram (fig. 19.1) and then make test connections per test fixture connection diagram (fig. 19.2).

(3) Turn on power supply and adjust for +45 volts dc ±1. Then, turn off power supply.

(4) Insert module into test fixture socket; be sure that module can is fully down and making contact with header. Again turn on power supply and check to see that power supply voltage is still +45 volts dc ±1.

(5) Set signal generator to 4.3 MHz, modulation selector to CW, and output to 0.005 volt rms.

(6) Connect vtvm to diode output and tune signal generator for maximum dc voltage output. Observe frequency for maximum output, using signal generator vernier (one dividion equals 4kHz) and built-in crystal calibrator to set 4.3-MHz point (4.3 MHz ±30 kHz).

(7) Adjust potentiometer R23 for diode output of -2.5 volts dc. If unable to make this adjustment, enter minimum or maximum voltage obtainable to facilitate troubleshooting.

(8) Turn off all power, disconnect test equipment, and remove module.

Page 57. Paragraph 54.1 and figures 30.2 and 30.3 are added after paragraph 54.

54.1. Disassembly-Assembly of Diode Module U209, R-744B/PRR

a. Disassembly.

(1) Remove diode module from if. assembly by pulling module from socket.

(2) Unsolder base and remove case from diode module. Remove insulator.

(3) Remove 5 screws, 10 spacers and 5 flat washers, lockwashers and hex nuts.

(4) Separate assembly boards from spacers and repair or replace defective component or connection on assembly boards.

b. Assembly.

(1) Place assembly boards on spacer and secure with 5 screws, 10 spacers and 5 flat washers, lockwashers and hex nuts.

(2) Install insulator.

(3) Install and solder base to diode module.

(4) Install diode module in if. assembly.

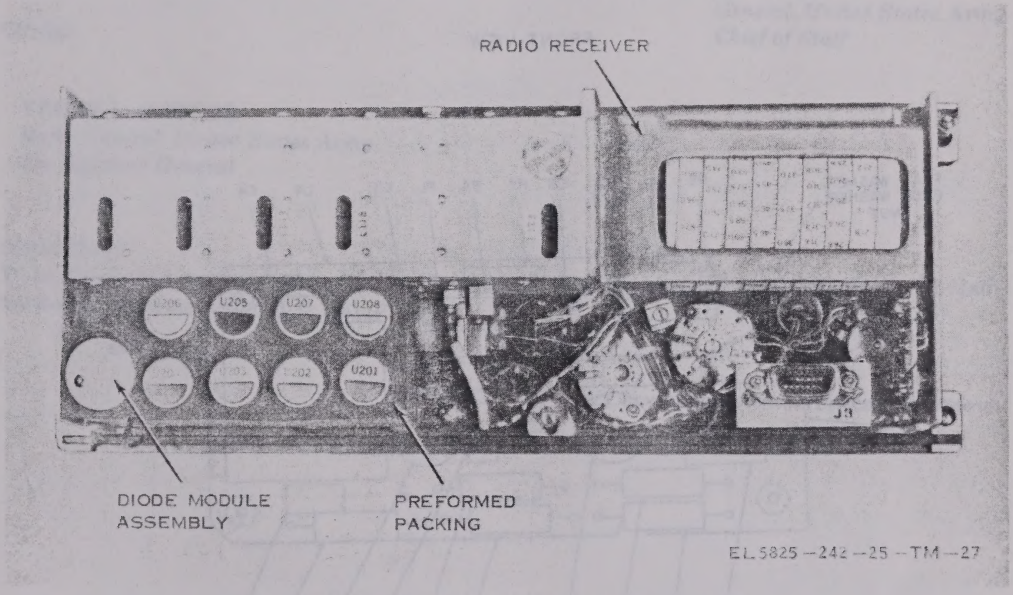
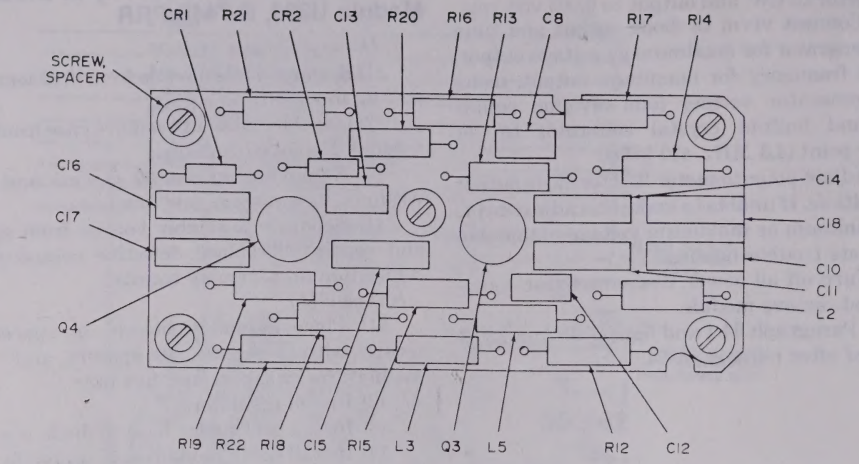


Figure 30.2. Vhf receiver, R-744B/PRR (unit 22 and 23), rear view.



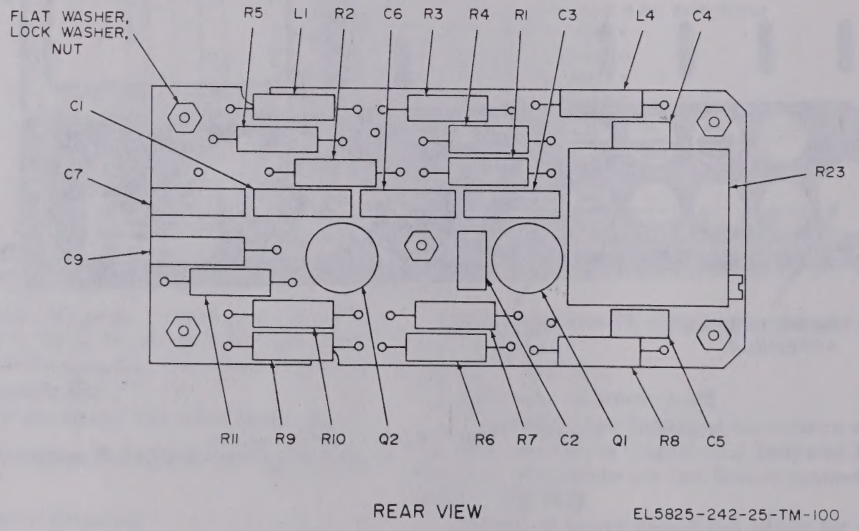


Figure 30.3. Vhf receiver, R-744B/PRR, diode module 22 and 23A1A3A1, component location diagram.

Page 60. Paragraph 59.1 and figure 31.1 are added after paragraph 59.

59.1. Vhf Receiver Diode Output Test

Perform test after repair of diode module.

a. Connect equipment as shown in test setup (fig. 31.1) and operate vhf receiver in vehicular power supply mode.

b. Set function selector switch on vhf receiver to AM and turn RF GAIN control fully clockwise.

c. Set signal generator for 40-MHz test frequency and modulate 30 percent at 1 kHz.

d. Adjust receiver tuning controls to test frequency.

e. Adjust sensitivity of receiver to attain 10-db signal-to-noise ratio and check to see that receiver sensitivity is 1 microvolt.

f. Check to see that indication of vtvm is not less than -2.5 volts dc at diode output receptacle.

g. Check for presence of -2.5 vdc on pin 4 of P302.

h. Turn off power and disconnect equipment.

Page 66. Make the following changes to figure 34 2: From terminal 2 of if. amplifier U203, draw a line and label, TO PIN 5 OF U209.

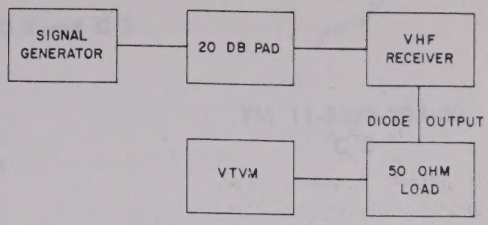


Figure 31.1. Vhf receiver, R-744B/PRR diode output test setup.

Add the following note:

5. Corrections to U203 if. amplifier apply to R-744B/PRR.

By Order of the Secretary of the Army:

FRED C. WEYAND
General, United States Army
Chief of Staff

Official:

VERNE L. BOWERS
Major General, United States Army
The Adjutant General

Distribution:
To be distributed in accordance with DA Form 12-51, (qty rqr block no. 842). Organizational Maintenance requirements for O A-1451/PRR.

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TECHNICAL DATA

TM 11-5825-203-20
*C 3

Organizational Maintenance Manual
RECEIVER GROUP OA-1451/PRR

CHANGE
No. 3

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., *10 March 1964*

TM 11-5825-203-20, 10 April 1961, is changed as follows:

Page 67, appendix II (as added by C 1, 11 Sep 1961), delete and substitute:

APPENDIX II

MAINTENANCE ALLOCATION

RECEIVER GROUP OA-1451 (XE-3/PRR AND RECEIVER GROUP OA-1451/PRR

Section 1. INTRODUCTION

1. General

a. This section assigns maintenance functions to be performed on components, assemblies, and subassemblies by the lowest appropriate maintenance echelon.

b. Columns in the maintenance allocation chart are as follows:

(1) *Part or component.* This column shows only the nomenclature or standard item name. Additional descriptive data are included only where clarification is necessary to identify the component. Components, assemblies, and subassemblies are listed in top-down order. That is, the assemblies which are part of a component are listed immediately below that component, and the subassemblies which are part of an assembly are listed immediately below that assembly. Each generation breakdown (components, assemblies, or subassemblies) is listed in disassembly order or alphabetical order.

(2) *Maintenance function.* This column indicates the various maintenance functions allocated to the echelons.

(*a*) *Service.* To clean, to preserve, and to replenish lubricants.

(*b*) *Adjust.* To regulate periodically to prevent malfunction.

(*c*) *Inspect.* To verify serviceability and to detect incipient electrical or mechanical failure by scrutiny.

(*d*) *Test.* To verify serviceability and to detect incipient electrical or mechanical failure by use of special

* This change supersedes C 1, 11 September 1961.

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equipment such as gages, meters, etc.

(e) Replace. To substitute serviceable components, assemblies, or subassemblies, for unserviceable components, assemblies, or subassemblies.

(f) Repair. To restore an item to serviceable condition through correction of a specific failure or unserviceable condition. This function includes but is not limited to welding, grinding, riveting, straightening, and replacement of parts other than the trial and error replacement of running spare type items such as fuses, lamps, or electron tubes.

(g) Align. To adjust two or more components of an electrical system so that their functions are properly synchronized.

(h) Calibrate. To determine, check, or rectify the graduation of an instrument, weapon, or weapons system, or components of a weapons system.

(i) Overhaul. To restore an item to *completely serviceable* condition as prescribed by serviceability standards. This is accomplished through employment of the technique of "Inspect and Repair Only as Necessary" (IROAN). Maximum utilization of diagnostic and test equipment is combined with minimum disassembly of the item during the overhaul process.

(j) Rebuild. To restore an item to a standard as near as possible to original or new condition in appearance, performance, and life expectancy. This is accomplished through the maintenance technique of complete disassembly of the item, inspection of all parts or components, repair or replacement of worn or unserviceable elements using original manufacturing tolerances and/or specifications and subsequent reassembly of the item.

(3) *1st, 2d, 3d, 4th, 5th echelons.* The symbol X indicates the echelon responsible for performing that particular maintenance operation, but does not necessarily indicate that repair parts will be stocked at that level. Echelons higher than the echelon marked by X are authorized to perform the indicated operation.

(4) *Tools required.* This column indicates codes assigned to each individual tool equipment, test equipment, and maintenance equipment referenced. The grouping of codes in this column of the maintenance allocation chart indicates the tool, test, and maintenance equipment required to perform the maintenance function.

(5) *Remarks.* Entries in this column will be utilized when necessary to clarify any of the data cited in the preceding column.

c. Columns in the allocation of tools for maintenance functions are as follows:

(1) *Tools required for maintenance functions.* This column lists tools, test, and maintenance equipment required to perform the maintenance functions.

(2) *1st, 2d, 3d, 4th, 5th echelon.* The dagger (†) indicates the echelons normally allocated the facility.

(3) *Tool code.* This column lists the tool code assigned.

2. Maintenance by Using Organizations

When this equipment is used by signal services organizations organic to theater headquarters or communication zones to provide theater communications, those maintenance functions allocated up to and including fourth echelon are authorized to the organization operating this equipment.

SECTION II. MAINTENANCE ALLOCATION CHART

PART OR COMPONENT	MAINTENANCE FUNCTION	ECHELON 1	2	3	4	5	TOOLS REQUIRED	REMARKS
RECEIVER GROUPS OA-1451(XE-3)/PRR AND OA-1451/PRR	service	X					19	
	adjust		X				19	
	inspect	X						No tools or test equipment required
	test		X				1,2,4,6,8,9,10,11,12,15,16,19	
					X		1,2,3,4,5,7,8,9,10,11,12,14,17,18	
	repair		X				19	
	align		X				1,2,4,6,9,11,12,14,19	
	calibrate				X		1,2,4,5,7,9,11,12,13,14,17,18	
	rebuild					X	17,18	Plus Depot Facilities
	overhaul				X		17,18	Plus Depot Facilities
CABLE ASSEMBLY, POWER, ELECTRICAL CX-4377(XE-3)/U AND CX-4377/U	service	X					19	
	inspect	X						
	test		X				8	
	repalce		X				19	
	repair		X				19	
CASE, ACCESSORIES CY-2331(XE-3)/PRR AND CY-2331/PRR	service	X					19	
	inspect	X						
	repair		X				19	
CABLE ASSEMBLY, SPECIAL PURPOSE, ELECTRICAL	service		X				19	
	inspect		X					
	test		X				8-	
	repair		X				19	
FIELD PACK, CANVAS CW-457(XE-3)/PRR AND CW-457/PRR	service		X				19	
	inspect		X					
	repair					X	17,18	
FIELD PACK, CANVAS CW-458(XE-3)/PRR AND CW-458/PRR	service		X				19	
	inspect		X					
	repair					X	17,18	
MOUNTING MT-1988/PRR	service		X				19	
	inspect		X					
	repair		X				19	
POWER SUPPLY PP-1481(XE-3)/PRR AND PP-1481/PRR	service		X				19	
	inspect		X					
	test		X				8	
	replace		X				19	
	repair		X				19	
BOARD, PRINTED CIRCUIT	service		X				19	
	inspect		X					
	test		X				8	
	replace				X		17,18	

PART OR COMPONENT	MAINTENANCE FUNCTION	ECHELON 1	2	3	4	5	TOOLS REQUIRED	REMARKS
RECEIVER GROUPS OA-1451(XE-3)/PRR AND OA-1451/PRR (continued)								
RECEIVER, RADIO R-744/(XE-3)/PRR, R-744/PRR AND R-744A/PRR	service	X					19	
	adjust		X				19	
	inspect	X						
	test		X				1,2,4,5,6,7,8,9,10, 11,12,13,15,19	
	replace		X				19	
	repair		X				19	
	align		X				1,2,4,5,6,7,8,9,10, 11,12,13,15,19	
	calibrate				X		1,2,4,5,6,7,9,11,12, 13,17,18	
AMPLIFIER, AUDIO FREQUENCY	service		X				19	
	inspect		X					
	test		X				8	
	replace		X				19	
AMPLIFIER-DETECTOR	service		X				19	
	inspect		X					
	test		X				8	
	replace		X				19	
AMPLIFIER, IF	service		X				19	
	inspect		X					
	test		X				8	
	replace		X				19	
CALIBRATOR, FREQUENCY	service		X				19	
	inspect		X					
	test		X				6,7,8	
	replace		X				19	
DETECTOR, RADIO FREQUENCY	service		X				19	
	adjust					X	17,18	
	inspect		X					
	test		X				8	
	replace		X				19	
OSCILLATOR, RADIO FREQUENCY	service		X				19	
	inspect		X					
	test		X				6,7,8	
	replace		X				19	
TUNER ASSEMBLY	service		X				19	
	adjust		X				19	
	inspect		X					
	test		X				8	
	replace		X				19	Not stocked - but issued upon proper authorization
	repair		X				19	
	align		X				19	
	rebuild					X	See remarks	Done at contractor's plant under support contract
	overhaul					X	See remarks	

SECTION III. ALLOCATION OF TOOLS FOR MAINTENANCE FUNCTIONS

PART OR COMPONENT	ECHELON 1	2	3	4	5	TOOL CODE	REMARKS
RECEIVER GROUPS OA-1451(XE-3) AND OA-1451/PRR (continued)							
ADAPTER UG-327/U		†		†	†	1	
ADAPTER UG-335/U		†		†	†	2	
ANALYZER, SPECTRUM TS-723/U				†	†	3	
ATTENUATOR CN-39/U		†		†	†	4	
AUDIO OSCILLATOR TS-382/U				†	†	5	
FREQUENCY METER AN/URM-26				†	†	6	
FREQUENCY METER AN/URM-32		†				7	
MULTIMETER AN/URM-105		†				8	
MULTIMETER ME-26A/U		†		†	†	9	
MULTIMETER TS-352/U				†	†	10	
POWER SUPPLY PP-1243/U		†		†	†	11	
SIGNAL GENERATOR AN/URM-48		†		†	†	12	
SIGNAL GENERATOR TS-497/URR		†		†	†	13	
TEST SET, ELECTRON TUBE TV-2/U					†	14	
TEST SET ELECTRON TUBE TV-7/U		†		†		15	
VOLTMETER ME-30/U		†		†	†	16	
TOOL KIT, RADAR & RADIO REPAIRMAN TK-87/U				†	†	17	
TOOL KIT, SUPPLEMENTARY, RADAR & RADIO REPAIRMAN TK-88/U				†	†	18	
TOOL KIT, RADIO REPAIRMAN TK-115/G		†				19	

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319th USASA Bn (5)
321st USASA Bn (5)
600th USASA Co (5)
102 USASA Det (5)
104 USASA Det (5)
Instl (2) except
Ft Monmouth (63)
Ft Hancock (4)
Ft Gordon (5)
Ft Huachuca (10)
Ft Devens (5)
Svc Colleges (2)
Br Svc Sch (2)
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Sig Sec, GENDEP (OS) (5)
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Sacramento (28)
Tobyhanna (12)
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For explanation of abbreviations used, see AR 320-50.

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TM 11–5825–203–20
C 4

Organizational Maintenance Manual

RECEIVER GROUP OA–1451/PRR AND OA–1451A/PRR

CHANGE No. 4

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HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D. C, 20315, *14 October 1964*

mt 1/8/65

TM 11–5825–203–20, 10 April 1961, is changed as follows:

The title of the manual is changed as shown above.

Note. The parenthetical reference to previous changes (example: page 1 of C 1) indicate that pertinent material was published in that change.

Page 2, chapter 1. Add the following note below the chapter heading:

Note. Receiver Group OA–1451A/PRR and Radio Receiver R–744A/PRR are similar to Receiver Group OA–1451/PRR and Radio Receiver R–744/PRR. Information in this manual applies to both sets unless otherwise specified.

Paragraph 2*c* (page 1 of C 2). Delete the fourth sentence and substitute: The original and one copy will be forwarded direct to Commanding General, U. S. Army Electronics Command, ATTN: AMSEL–MR–MP–P, Fort Monmouth, N. J. 07703.

b. To gain access to the R–744A/PRR gears and bushings within the gearbox, proceed as directed in paragraph 53*a*(6.1)(*a*) and (*b*).

(1) Remove the two flathead screws from the bottom of the gearbox.

(2) Remove bottom plate and gasket. Be careful not to damage the gasket.

c. Lubricate all gears with Grease, Aircraft and Instrument (GL), MIL–G–3278. Spread a small amount of grease over the gear teeth. Wipe off the excess grease; do not overlubricate.

d. To replace the R–744A/PRR gearbox, proceed as follows:

(1) Replace the gasket and bottom plate. Tighten the two flathead screws until they are snug.

(2) Complete the reassembly as outlined in paragraph 53*b*(4.1) and (5.1).

Page 58. Add figure 30.1 after paragraph 57.

Page 56, paragraph 53*a*(6). Add subparagraph (6.1) after subparagraph (6).

(6.1). On the R–744A/PRC (fig. 30.1) proceed as follows:

(*a*) Remove the center screw from the coarse and fine tuning knobs. Loosen the recessed head setscrews and remove the tuning knobs and O-rings.

(*b*) Remove the four gearbox mounting screws and remove the gearbox, taking care not to damage the gasket.

Add subparagraph (7.1) after subparagraph (7).

(7.1). On the R–744A/PRR (fig. 30.1), proceed as follows:

Add subparagraph (7.1) after subparagraph (7).

(7.1). On the R–744A/PRR (fig. 30.1), proceed as follows:

(*a*) Loosen the setscrew in the collar on the internal end of the dial lock shaft, and remove the collar.

(*b*) Remove the dial lock shaft, bushing, and locking pin.

(*c*) Remove the drive assembly by loosening the setscrews.

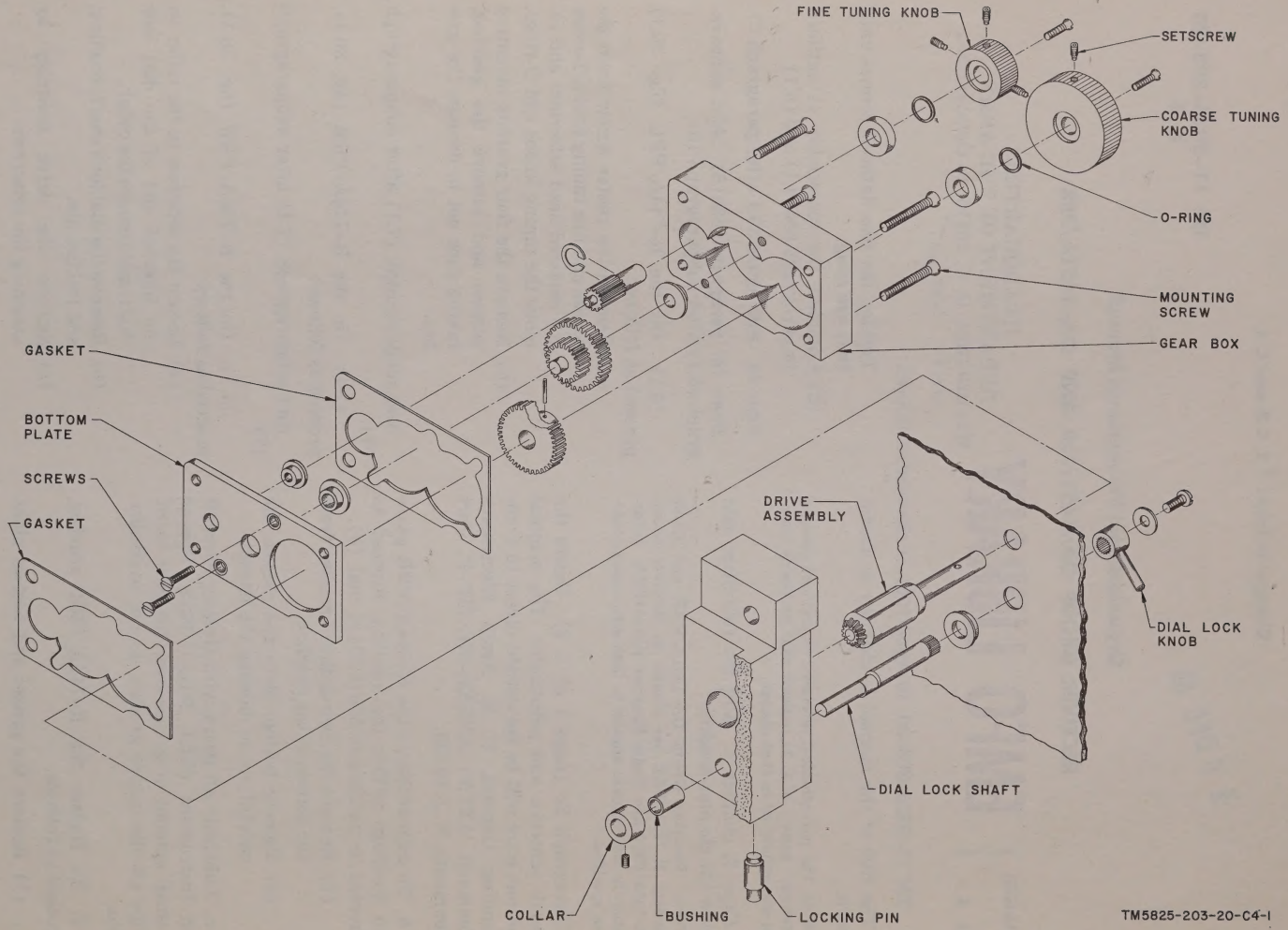

Figure 30.1. Disassembly of OA–1451A/PRR gear box.

Page 57, paragraph 53*b*. Add subparagraph (2.1) after subparagraph (2).

(2.1). On the R–744A/PRR (fig. 30.1), perform the following procedure:

(*a*) Insert the drive assembly firmly, meshing the bevel gear of the drive assembly with the bevel gear of the tuner shaft, and tighten the two holding screws The gears must mesh tightly to eliminate backlash.

(*b*) Insert the locking pin, bushing, and dial lock shaft.

(*c*) Replace the dial lock shaft collar.

Add subparagraph (4.1) after subparagraph (4).

(4.1). On the R–744A/PRR (fig. 30.1), proceed as follows:

(*a*) Replace the gearbox gasket and the four gearbox mounting screws.

(*b*) Tighten the screws uniformly.

Add subparagraph (5.1) after subparagraph (5).

(5.1). On the R–744A/PRR (fig. 30.1), perform the following procedure:

(*a*) Replace the O-rings, coarse and fine tuning knobs, and the center screws.

(*b*) Tighten the two recessed head set-screws in each tuning knob.

Page 57, paragraph 55. Delete paragraph 55 and substitute:

55. Lubrication

a. The only components that require lubrication at organizational level are the bevel gears in the rf tuning assembly, and the bushings and gears in the gearbox on R–744A/PRR. The bevel gears (fig. 31) are exposed when the receiver is removed from the cover assembly. Lubrication of the bevel gears should be performed when repairs are made in the rf tuning assembly.

Page 67, appendix I (page 2 of C 2). Add the following reference:

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For explanation of abbreviations used, see AR 320–50.

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TECHNICAL DATA

Changes in force: C 1 and C 2

TM 11–5825–203–20
C 2

TECHNICAL MANUAL

Organizational Maintenance Manual

RECEIVER GROUP OA–1451/PRR

TM 11–5825–203–20
CHANGE No. 2

HEADQUARTERS,
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., *5 September 1963*

TM 11–5825–203–20, 10 April 1961, is changed as follows:

Note. The parenthetical reference to previous changes (example: "page 1 of C 1") indicates that pertinent material was published in that change.

Page 2, paragraph 1. Add paragraph 1.1 after paragraph 1.

1.1. Index of Publications

Refer to the latest issue of DA Pam 310–4 to determine whether there are new editions, changes, or additional publications pertaining to your equipment. DA Pam 310–4 is an index of current technical manuals, technical bulletins, supply bulletins, lubrication orders, and modification work orders that are available through publications supply channels. The index lists the individual parts(–10, –20, –35P, etc.) and the latest changes to and revisions of each equipment publication.

Paragraph 2 (page 1 of C 1). Delete paragraph 2 and substitute:

2. Forms and Records

a. Reports of Maintenance and Unsatisfactory Equipment. Use equipment forms and records in accordance with instructions in TM 38–750.

b. Report of Damaged or Improper Shipment. Fill out and forward DD Form 6 (Report of Damaged or Improper Shipment) as prescribed in AR 700–58 (Army), NAVSANDA Publication 378 (Navy), and AFR 71–4 (Air Force).

c. Reporting of Equipment Manual Improvements. The direct reporting by the individual user of errors, omissions, and recommendations for improving this manual is authorized and encouraged. DA Form 2028 (Recommended Changes to DA Technical Manual Parts Lists or Supply Manual 7, 8 or 9) will be used for reporting these improvements. This form will be completed in triplicate using pencil, pen, or typewriter. The original and one copy will be forwarded direct to: Commanding Officer, U.S. Army Electronics Materiel Support Agency, ATTN: SELMS–MP, Fort Monmouth, N.J. One information copy will be furnished to the individual's immediate supervisor (e.g., officer, noncommissioned officer, supervisor, etc.).

Page 26. Make the following changes:

Delete paragraph 28 and substitute:

28. Preventive Maintenance

a. Preventive maintenance is the systematic care, inspection, and servicing of equipment to maintain it in serviceable condition, prevent breakdowns, and assure maximum operational capability. Preventive maintenance is the responsibility of all echelons concerned with the equipment and includes the inspection, testing, and repair or replacement of parts, subassemblies, or units that inspection and tests indicate would probably fail before the next scheduled periodic service. Preventive maintenance checks and services of Receiver Group OA–1451/PRR at the second echelon level are made at quarterly intervals unless otherwise directed by the commanding officer. The preventive maintenance checks and services should be scheduled concurrently with the periodic service schedule of the carrying vehicle for all vehicular installations.

b. Maintenance forms and records to be used and maintained on this equipment are specified in TM 38–750.

c. Clean rust and corrosion from metal surfaces by lightly sanding them with fine sandpaper. Brush two thin coats of the proper paint on bare metal to protect it from further corrosion. Refer to the applicable cleaning and refinishing practices specified in TM 9–213.

Add paragraphs 28.1 and 28.2 after paragraph 28.

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TECHNICAL DATA

Changes in force: C 1 and C 2

TM 11–5825–203–20
C 2

TECHNICAL MANUAL

Organizational Maintenance Manual

RECEIVER GROUP OA–1451/PRR

TM 11–5825–203–20
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TM 11–5825–203–20, 10 April 1961, is changed as follows:

Note. The parenthetical reference to previous changes (example: "page 1 of C 1") indicates that pertinent material was published in that change.

Page 2, paragraph 1. Add paragraph 1.1 after paragraph 1.

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c. Clean rust and corrosion from metal surfaces by lightly sanding them with fine sandpaper. Brush two thin coats of the proper paint on bare metal to protect it from further corrosion. Refer to the applicable cleaning and refinishing practices specified in TM 9–213.

Add paragraphs 28.1 and 28.2 after paragraph 28.

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RECEIVER GROUP OA-1451/PRR

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CHAPTER 1
INTRODUCTION

1. Scope

a. This manual covers installation and second echelon maintenance of Receiver Group OA-1451/PRR. Operating instructions for this equipment are contained in TM 11-5825-203-10.

b. Second echelon maintenance of Receiver Group OA-1451/PRR consists of the following:

(1) Preventative maintenance (para 27 and 28).
(2) Troubleshooting (para 29-48).
(3) Repairs (para 49-55).
(4) Alignment (para 56-59).

c. The theory of operation of Receiver Group OA-1451/PRR is included in this manual to support the second echelon maintenance.

2. Comments on Manual

Forward comments concerning this manual direct to the Commanding Officer, U.S. Army Signal Materiel Support Agency, ATTN: SIGMS-PA2d, Fort Monmouth, N. J.

Note. For applicable forms and records, see paragraph 2, TM 11-5825-203-10.

CHAPTER 2
INSTALLATION

3. Unpacking

a. Packaging Data. When packed for shipment, the components of Receiver Group OA-1451/PRR are placed in two cartons and packed in a wooden packing case. The packing case is 40 inches deep, 20 inches wide, and 11 inches high; the gross weight is 70 pounds. A typical packing case and its contents are shown in figure 1.

b. Removing Contents (Wooden Packing Case). Perform all the steps outlined below when unpacking equipment packed in a wooden packing case (fig. 1).

(1) Cut and fold back the metal straps.
(2) Remove the nails from the cover and one side of the wooden packing case with a nailpuller. Remove the cover and one side. Do not attempt to pry off the cover or sides; this may damage the equipment.
(3) Open the moistureproof barrier that covers the outer corrugated carton. Remove the carton.
(4) Open the outer corrugated carton and the moisture-vaporproof barrier within the carton. Remove the inner corrugated carton.
(5) Open the inner corrugated carton and remove the canvas field pack.

c. Removing Contents (Carton). When unpacking equipment packed only in corrugated cartons, perform steps (4) and (5) in *b* above.

4. Checking Unpacked Equipment

a. Inspect the equipment for possible damage incurred during shipment. If the equipment has been damaged, refer to TM 11-5825-203-10.

b. See that the equipment is complete as listed on the packing slip. If a packing slip is not available, check the equipment against the table of components of the basic items issue list in TM 11-5825-203-10.

c. If the equipment has been used or reconditioned, see whether it has been changed by a modification work order (MWO). If modified, the MWO number will appear on the front panel near the nomenclature plate. Check to see that this MWO number also appears on the diagrams in this manual. If not, add a note to the overall schematic diagram.

5. Installation for Portable Operation

a. Receiver Check. The receiver is shipped completely assembled, with the power supply installed and all internal connecting cables, sealed pluck-out units, tubes, and the fuse in place. Before placing the receiver in operation, perform the following procedure:

(1) Remove the receiver from the receiver field pack.
(2) Loosen the six captive retaining screws in the receiver front panel and remove the receiver chassis from the cover assembly.
(3) By careful finger pressure, check to see that all miniature tubes (V101 through V106) in the radiofrequency (rf) tuner assembly are properly seated and clamped. These six tubes are accessible from one side of the chassis (fig. 2).
(4) Check to see that the eight sealed pluck-out units (U201 through U208) in the amplifier assembly (fig. 2) are properly seated.
(5) Check to see that all internal connectors are firmly mated.
(6) Check fuse F301 (fig. 20) located on the cover of the power supply.

Caution: **Use a 1/4-ampere, MIL-type FO2GR250A fuse only.**

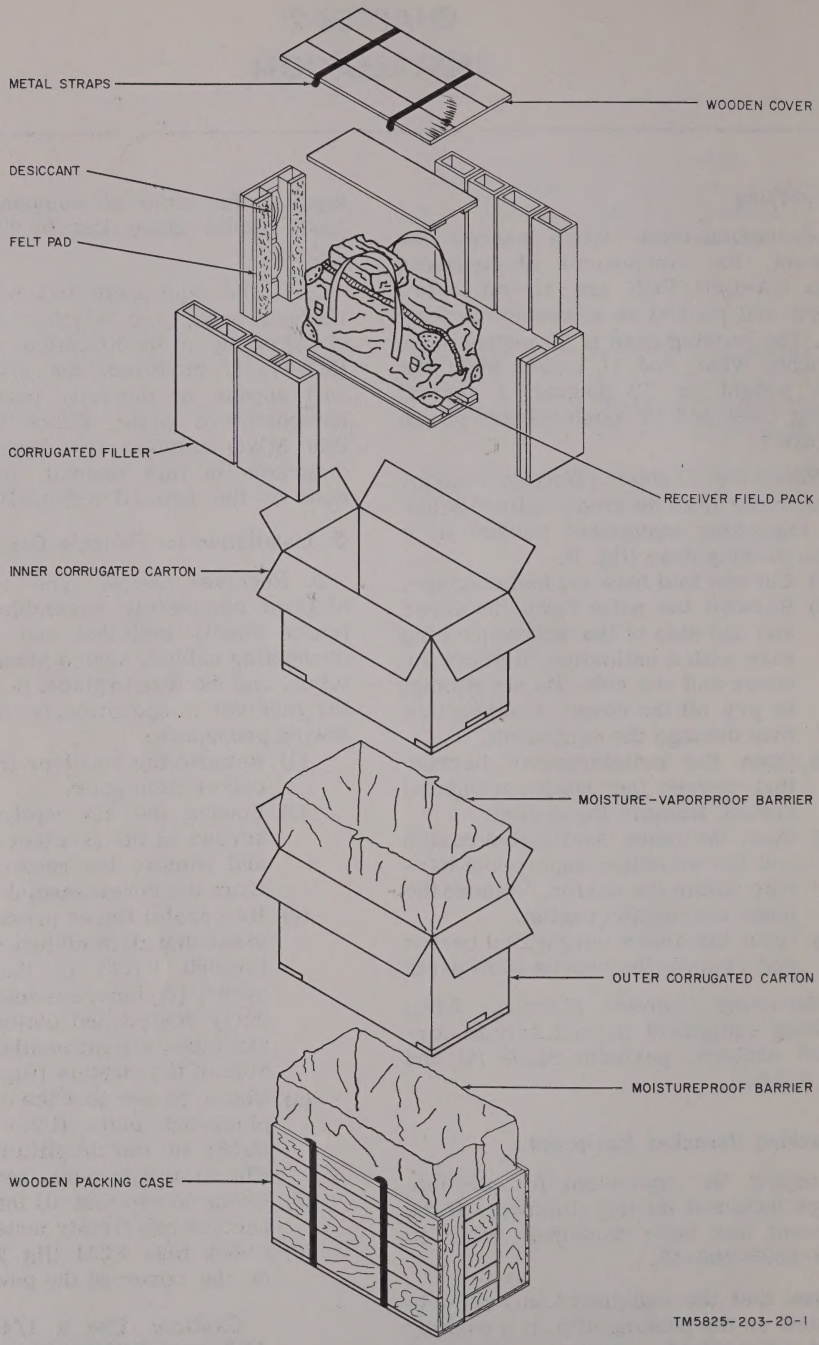

Figure 1. Typical packaging.

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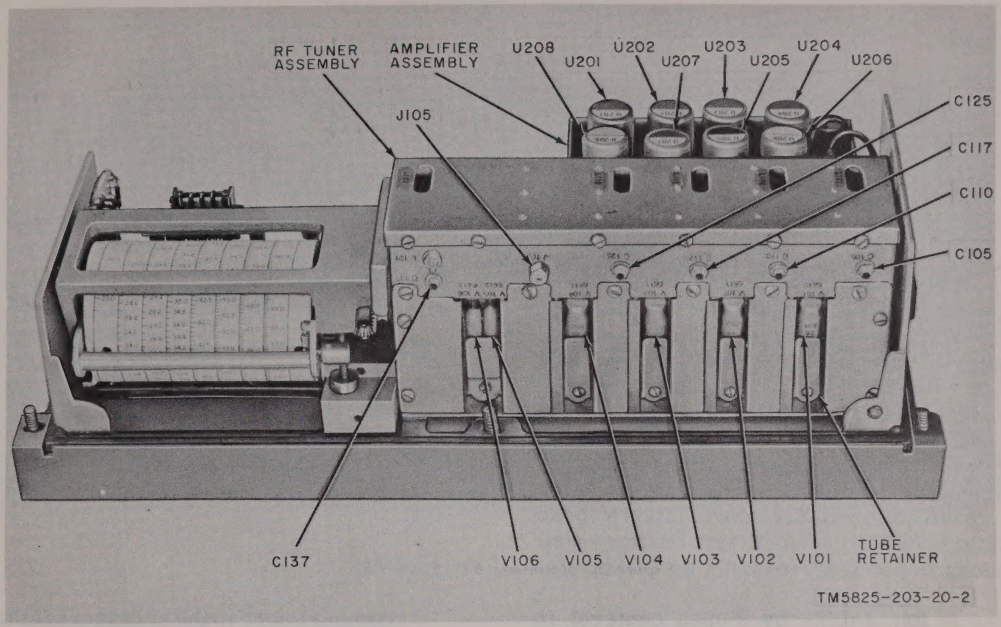


Figure 2. Location of receiver pluck-out units, tubes, and alignment points.

(7) Replace the receiver chassis in the cover assembly and tighten the six retaining screws on the receiver front panel.

b. Internal Batteries. The procedure for installing the A- and B- batteries in the battery compartments of the receiver is given in TM 11-5825-203-10.

c. Direction-Finder Antenna. Remove the protective cap from the DF ANT receptacle on the receiver front panel and connect the coaxial lead-in cable from the direction-finder antenna supplied. For installation details covering the direction-finder antenna, refer to the manuals supplied with that equipment.

d. Very-High-Frequency Antenna. A whip-type antenna equipped with a coaxial lead-in cable is used for intercept operation of the receiver. Unscrew the protective cap from the ANT receptacle on the receiver front panel and connect the antenna lead-in to this receptacle.

e. Headset. Connect a suitable 600-ohm headset with telephone plug PJ-055B (such as Headset HS-33) to the AUDIO receptacle on the receiver front panel.

6. Vehicular Installation

a. Receiver Chassis Check. After the equipment has been unpacked, remove the receiver from the receiver field pack and perform the checks described in paragraph 5*a*.

b. Internal Batteries. It is recommended that an A-battery, (Battery BA-403/U) and a B-battery (Battery BA-418/U) be installed in the receiver battery compartments to provide emergency standby power. Install the batteries in their respective compartments as described in TM 11-5825-203-10.

c. Mounting Base. In vehicular installations, the receiver is secured on Mounting MT-1988/PRR (fig. 3). To install the mounting, proceed as follows:

(1) Remove the mounting from the accessory field pack.

(2) Spot and drill four 1/4-inch holes

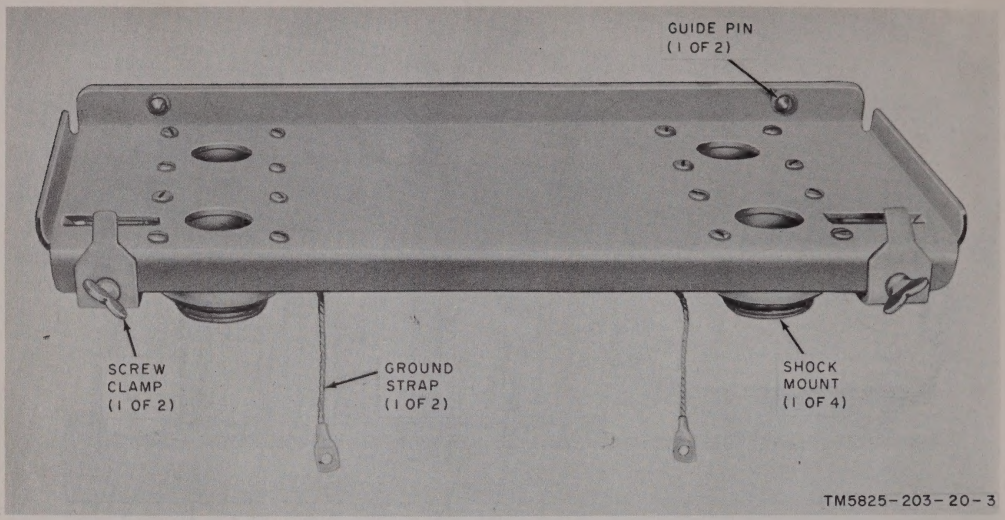


Figure 3. Mounting MT-1988/PRR.

(on 3-1/2- by 9-inch centers) in the vehicle, in accordance with the installation requirements of the specific vehicle.

(3) Bolt the mounting to the vehicle surface through each of the four shock mounts (fig. 3); use locally procured hardware.

(4) Bolt the ground straps on the mounting to convenient grounding points on the vehicle.

d. Installation of Receiver.

(1) Place the receiver on the mounting and position the receiver so that the guide pins located on the rear of the mounting (fig. 3) fit into corresponding depressions on the rear of the receiver cover assembly.

(2) Fasten the receiver to the mounting by tightening the two screw clamps on the front edge of the mounting.

e. Installation of Power Cable.

(1) Remove the power cable from its compartment in the accessory field pack.

(2) Attach the four-contact connector on the power cable to the VEH POWER receptacle on the receiver front panel.

(3) Connect the other end of the power cable to the 24-volt vehicular storage battery in accordance with the requirements of the particular vehicle installation. Be sure that sufficient cable slack exists so that no sharp bends can damage the cable. Observe the polarity of the battery and cable.

f. Antennas. Installation of the direction finder (df) and very-high-frequency (vhf) antennas is described in paragraphs 5*c* and 5*d*.

g. Headset. Connect a suitable 600-ohm headset to the AUDIO receptacle on the receiver front panel.

CHAPTER 3
THEORY

Section I. GENERAL THEORY OF RECEIVER GROUP OA–1451/PRR

7. General

This chapter contains detailed descriptions of the circuits in the receiver and power supply. A thorough understanding of the material in this chapter will aid second echelon maintenance personnel in performing efficient troubleshooting, repairs, and adjustments of the equipment as required by the maintenance allocation chart.

8. Block Diagram of Receiver Group OA–1451/PRR
(fig. 4)

Receiver Group OA-1451/PRR is a portable receiver operating directly from dry batteries or from a vehicle electrical system by means of self-contained Power Supply PP-1481/PRR. The receiver group may be operated as an intercept receiver or as a direction finder. When operated as an intercept receiver, a whip-type antenna is used. When operated as a direction finder, a loop-type antenna is used. Neither antenna is supplied as a part of the receiver group.

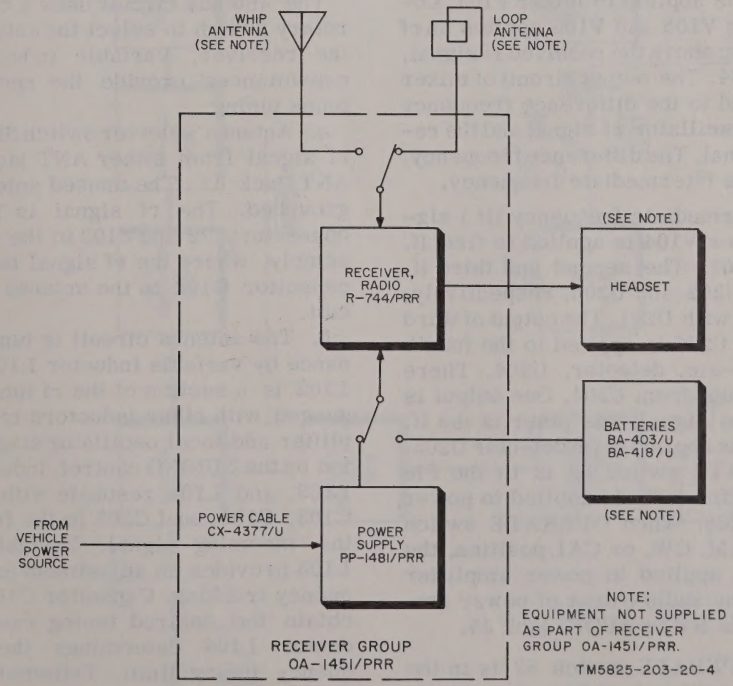


Figure 4. Receiver Group OA–1451/PRR, block diagram.

9. Block Diagram of Receiver, Radio R-744/PRR
(fig. 5)

Receiver, Radio R-744/PRR is capable of receiving continuous-wave (CW), amplitude-modulated (am.), and frequency-modulated (fm) signals over the continuously tunable frequency range of 20 to 100 megacycles (mc). Calibration checkpoints are provided at multiples of 2 mc. The receiver signal paths are shown in the block diagram and are discussed in *a* through *d* below.

a. An rf signal enters the receiver through either ANT jack J1 or DF ANT jack J2, as selected by antenna selector switch S1, for application to the antenna circuit. The signal induced in the antenna circuit is amplified by rf amplifiers V101, V102, and V103. The output of third rf amplifier V103 is applied to mixer V104. Local oscillator V105 and V106 applies an rf signal, 4.3 mc above the received rf signal, to mixer V104. The output circuit of mixer V104 is tuned to the difference frequency of the local oscillator rf signal and the received rf signal. The difference frequency, 4.3 mc, is the intermediate frequency.

b. The intermediate frequency (if.) signal from mixer V104 is applied to first if. amplifier U201. The second and third if. amplifiers, U202 and U203, respectively, are identical with U201. The output of third if. amplifier U203 is applied to the fourth if. amplifier-am. detector, U204. There are two outputs from U204. One output is the am. audio signal; the other is the if. signal which is applied to fm detector U205. When OPERATE switch S2 is in the FM position, the fm audio is applied to power amplifier U208. When OPERATE switch S2 is in the AM, CW, or CAL position, the am. audio is applied to power amplifier unit U208. The audio output of power amplifier U208 is fed to AUDIO jack J5.

c. When OPERATE switch S2 is in the CW or CAL position, beat frequency oscillator (bfo) U207 is made operative. The output frequency of the bfo is 4.3 mc, the same as the intermediate frequency. With OPERATE switch S2 in the CW position, reception of a cw signal produces an audible beat frequency when the TUNING control is detuned.

d. Calibration oscillator U206 is made operative when OPERATE switch S2 is in the CAL position. The calibration oscillator output frequency of 2 mc is applied to harmonic generator CR101. Harmonic frequencies of the 2-mc signal are produced an applied to the antenna circuit. The receiver calibration can be checked at each frequency which is a harmonic of 2 mc by setting the OPERATE switch to CAL and precisely tuning the receiver for a zero beat (null) indication.

10. Antenna Circuit
(fig. 6)

The antenna circuit uses a two-position rotary switch to select the antenna input to the receiver. Variable inductances and capacitances provide the necessary antenna tuning.

a. Antenna selector switch S1 selects the rf signal from either ANT jack J1 or DF ANT jack J2. The unused antenna jack is grounded. The rf signal is fed through connectors P2 and J102 to the rf tuner assembly, where the rf signal is coupled by capacitor C102 to the antenna tuning circuit.

b. The antenna circuit is tuned to resonance by variable inductor L102. Inductor L102 is a section of the rf tuner which is ganged with other inductors in the rf amplifier and local oscillator stages and varied by the TUNING control. Inductors L102, L103, and L104 resonate with capacitors C103, C104, and C105 to the frequency of the incoming signal. Variable inductor L103 provides an adjustment for high-frequency tracking. Capacitor C104 is used to obtain the desired tuning range and inductor L104 determines the high-frequency tuning limit. Trimmer capacitor C105 is an adjustment for low-frequency tracking. The rf signal developed across

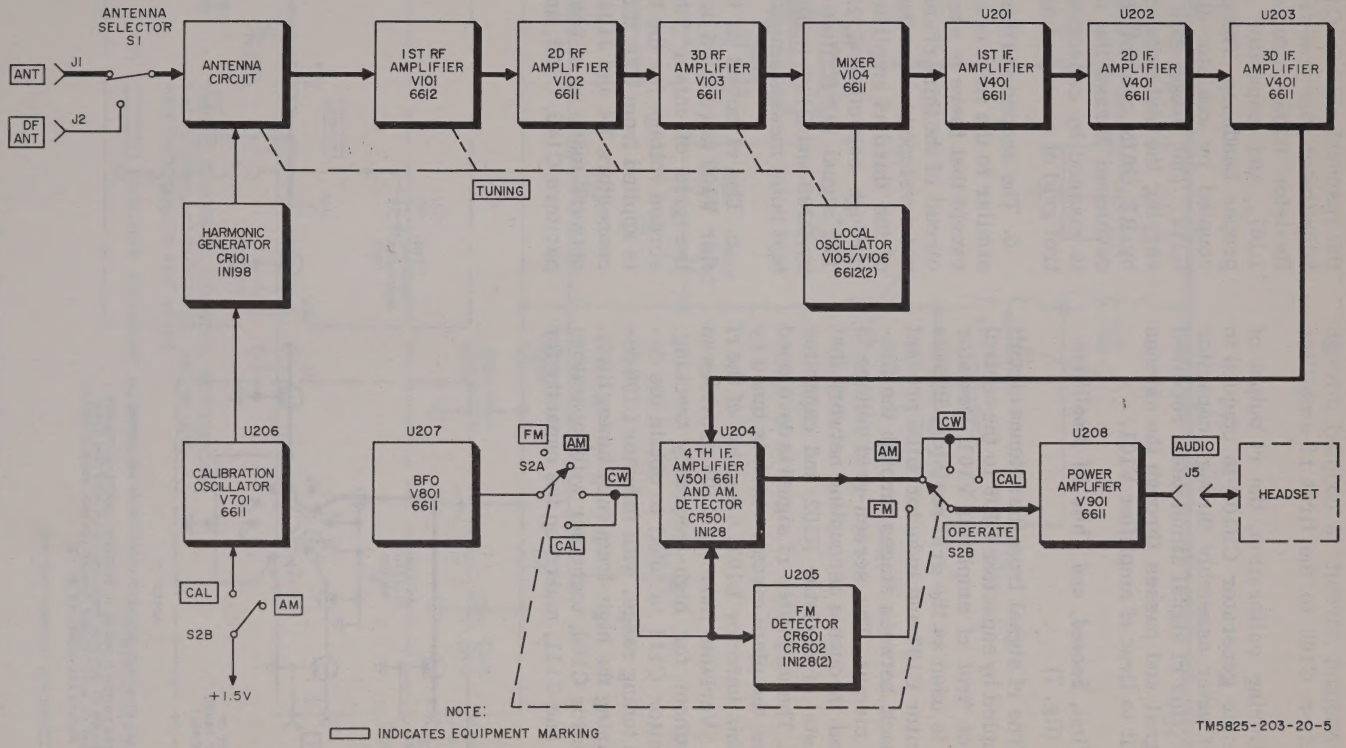


Figure 5. Receiver, Radio R-744/PRR, block diagram.

the resonant circuit is coupled through capacitor C106 to the first rf amplifier V101.

c. During calibration, the rf output of harmonic generator CR101 is coupled to the rf tuner assembly through capacitor C101. This rf signal simulates a received rf signal and passes through the antenna circuit to first rf amplifier V101.

11. First, Second, and Third Rf Amplifiers (fig. 7)

a. The rf signal from the antenna circuit is coupled by capacitor C106 to the control grid of first rf amplifier V101. Resistor R101 is used as the grid resistor. Bypass capacitor C107 and inductor L105 prevent feedback between stages through the filament circuit. The screen-grid voltage is applied through a decoupling network that consists of resistor R102 and capacitor C108. The amplified rf signal is developed across the plate circuit which is tuned by variable inductor L107, a section of the rf tuner. Variable inductor L108 provides an adjustment for high-frequency tracking. Capacitor C111 is used to obtain the desired tuning range, with inductor L106 determining the high-frequency tuning limit. Capacitor C109, toghether with capacitors C110 and C111, makes up the capacity for the resonant circuit. Capacitor C110 is an adjustment for low-frequency tracking. Resistor R103, inductor L109, inductor L107, and capacitor C111 provide the proper bandpass. The plate circuit is decoupled by resistor R105 and capacitor C112. The stage gain is controlled by varying the plate and screen-grid voltage by RF GAIN control R2A. The rf signal developed across the tuned plate circuit is coupled by capacitor C113 to the control grid of second rf amplifier V102.

b. The second and third rf amplifiers are similar to the first rf amplifier (*a* above), except that there is a test point in the plate circuit of the third rf amplifier. The rf signal developed across the tuned plate circuit of the third rf amplifier stage is coupled through capacitor C122 to diode CR102. The signal is rectified by CR102, filtered by R109 and C126, and applied to J105 for test point measurements.

c. The rf output of the third rf amplifier V103 is coupled by capacitor C129 to the grid of mixer V104. The plate and screen voltage for the three rf amplifiers is applied from R2A through terminal A of connectors P4 and J104 and the decoupling network made up of resistor R115 and capacitors C143, C133, and C132.

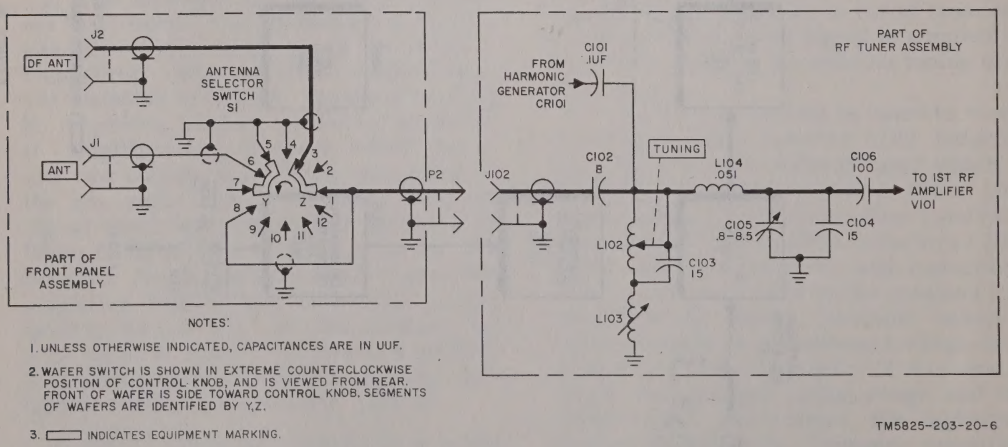
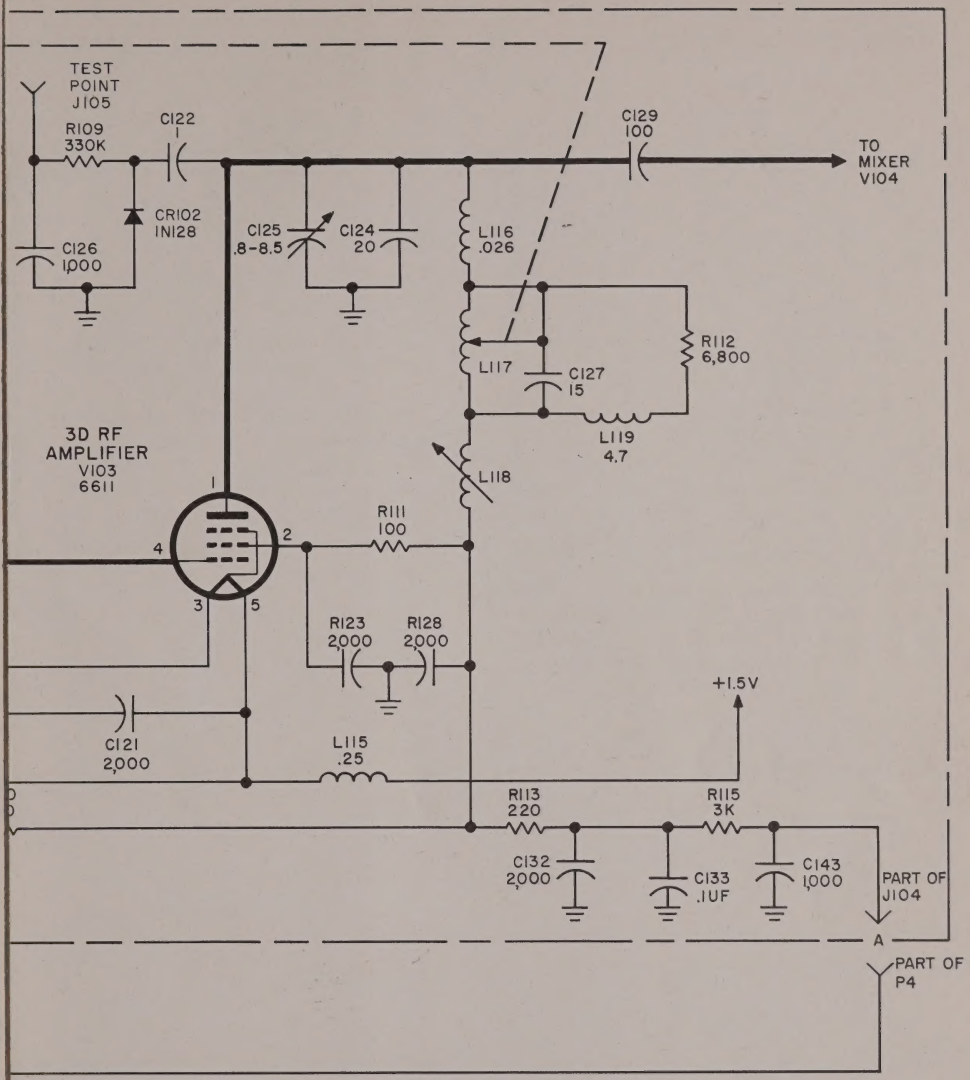


Figure 6. Antenna circuit, schematic diagram.



NOTES:

1. UNLESS OTHERWISE INDICATED, RESISTANCES ARE IN OHMS, CAPACITANCES ARE IN UUF, AND INDUCTANCES ARE IN UH.
2. ▭ INDICATES EQUIPMENT MARKING.

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the resonant circuit is coupled through capacitor C106 to the first rf amplifier V101.

c. During calibration, the rf output of harmonic generator CR101 is coupled to the rf tuner assembly through capacitor C101. This rf signal simulates a received rf signal and passes through the antenna circuit to first rf amplifier V101.

11. First, Second, and Third Rf Amplifiers (fig. 7)

a. The rf signal from the antenna circuit is coupled by capacitor C106 to the control grid of first rf amplifier V101. Resistor R101 is used as the grid resistor. Bypass capacitor C107 and inductor L105 prevent feedback between stages through the filament circuit. The screen-grid voltage is applied through a decoupling network that consists of resistor R102 and capacitor C108. The amplified rf signal is developed across the plate circuit which is tuned by variable inductor L107, a section of the rf tuner. Variable inductor L108 provides an adjustment for high-frequency tracking. Capacitor C111 is used to obtain the desired tuning range, with inductor L106 determining the high-frequency tuning limit. Capacitor C109, toghether with capacitors C110 and C111, makes up the capacity for the resonant circuit. Capacitor C110 is an adjustment for low-frequency tracking. Resistor R103, inductor L109, inductor L107, and capacitor C111 provide the proper bandpass. The plate circuit is decoupled by resistor R105 and capacitor C112. The stage gain is controlled by varying the plate and screen-grid voltage by RF GAIN control R2A. The rf signal developed across the tuned plate circuit is coupled by capacitor C113 to the control grid of second rf amplifier V102.

b. The second and third rf amplifiers are similar to the first rf amplifier (*a* above), except that there is a test point in the plate circuit of the third rf amplifier. The rf signal developed across the tuned plate circuit of the third rf amplifier stage is coupled through capacitor C122 to diode CR102. The signal is rectified by CR102, filtered by R109 and C126, and applied to J105 for test point measurements.

c. The rf output of the third rf amplifier V103 is coupled by capacitor C129 to the grid of mixer V104. The plate and screen voltage for the three rf amplifiers is applied from R2A through terminal A of connectors P4 and J104 and the decoupling network made up of resistor R115 and capacitors C143, C133, and C132.

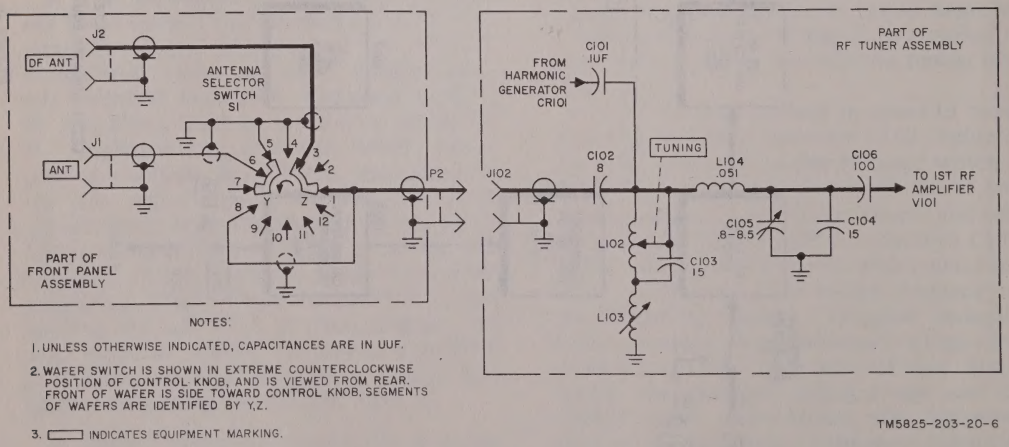


Figure 6. Antenna circuit, schematic diagram.

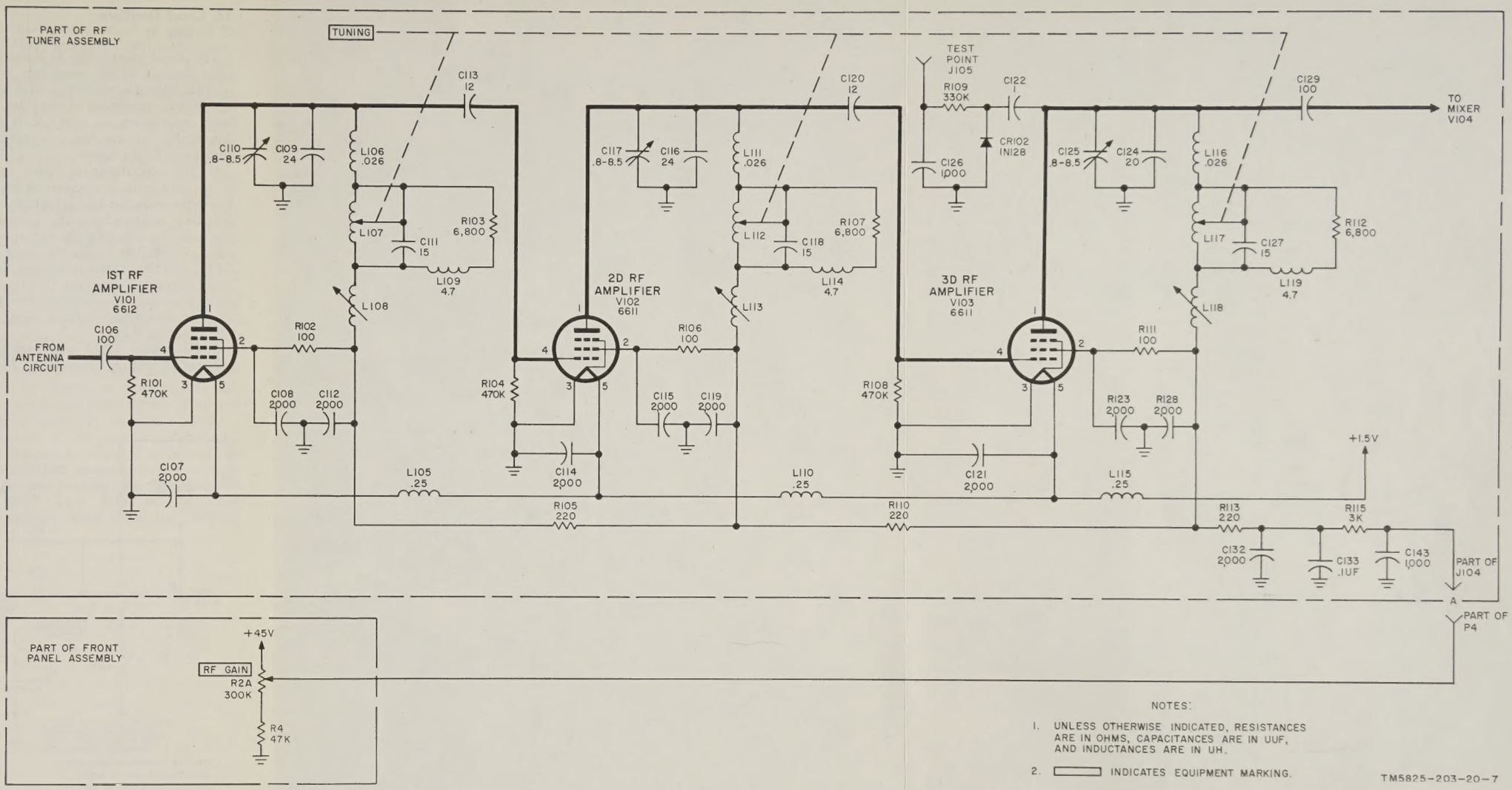


Figure 7. Rf amplifiers, schematic diagram.

12. Local Oscillator
(fig. 8)

The local oscillator is a modified Colpitts circuit which uses two triode-connected, subminature-type 6612 tubes, V105 and V106, connected in parallel. The feedback necessary to sustain oscillation is developed across the interelectrode capacitance of the tubes.

a. The oscillator is tuned by inductor L122, which is a section of the rf tuner. Variable inductor L123 is a high-frequency tracking adjustment. Low-frequency tracking is adjusted by variable inductor L121. Capacitor C136, trimmer capacitor C137, and the circuit inductors for the resonant circuit. Capacitor C137 is an adjustment for midfrequency tracking. Grid-leak bias is developed across capacitor C138 and resistor R117.

b. Capacitor C141 and inductor L124 prevent rf voltage from being fed from the oscillator to the filament circuit of other tubes. The plate is placed at rf ground potential by bypass capacitor C139. Resistor R118 is a decoupling resistor. The oscillator output signal is developed across inductor L125 and coupled by capacitor C130 to mixer V104.

13. Mixer
(fig. 9)

Signals from the third rf amplifier stage and the local oscillator stage are heterodyned within the mixer stage to produce an intermediate frequency of 4.3 mc.

a. The rf signal from third rf amplifier V103 is coupled by capacitor C129 to the control grid of mixer V104. The output signal from local oscillator V105 and V106 is coupled through capacitors C130 and C129 to the control grid of mixer V104. Resistor R114 is the grid resistor for the mixer.

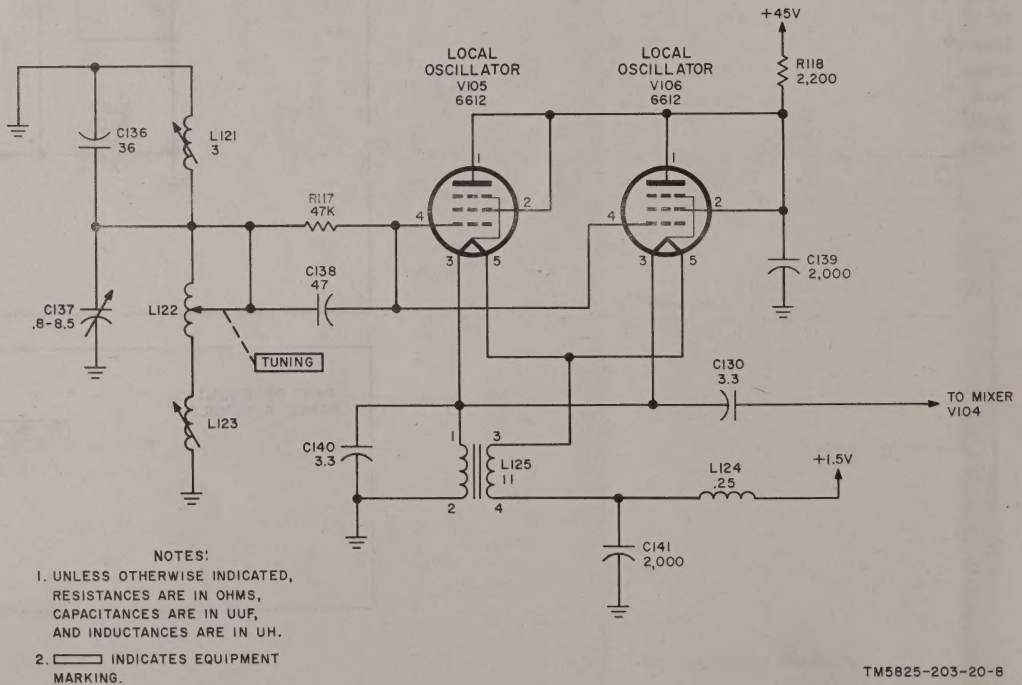


Figure 8. Local oscillator, schematic diagram.

b. The filament circuit rf filter consists of inductor L120 and bypass capacitor C131. Screen and plate decoupling is provided by capacitor C134 and resistor R116. The plate circuit, which is resonant to 4.3 mc, consists of capacitors C135 and the primary winding of if. transformer T101. The 4.3-mc signal induced into the secondary winding of transformer T101 is applied through jack J103, plug P103, coaxial cable W102, and jack J203, to first if. amplifier unit U201.

14. First, Second, and Third If. Amplifiers (fig. 10)

The 4.3-mc if. signal from the mixer stage is amplified by three similar if. amplifier stages. The if. amplifier stages use subminature-type 6611 pentodes and are contained in identical pluck-out units U201, U202, and U203. During AM, CW, or CAL operation, the if. gain is adjusted by R2B so that the if. amplifier stages function as class A amplifiers. In fm operation, the if. gain is adjusted to provide maximum gain, so that the if. amplifier stages function as limiters.

a. The if. signal is applied, for mixer V104 through coaxial cable W102, connectors P104 and J203, and coupling capacitor C207, to the grid circuit of first if. amplifier V401. Inductor L401 and capacitor C404 are series-resonant at 4.3 mc. Coupling capacitor C207 is of relatively large value and has negligible effect on the resonant frequency of the tuned circuit. The signal developed across capacitor C404 is applied to the control grid of first if. amplifier V401. The grid resistor is R210. Inductors L402, and L204, and capacitors C402B and C403 make up an rf filter in the filament circuit. Plate and screen-grid decoupling is provided by resistor R401 and capacitor C402C. Additional decoupling of the plate supply is provided by resistor R207 and capacitor C402D. The gain of the stage is adjustable by RF GAIN control R2B which varies the plate and screen grid voltage. The amplified if. signal is developed across the tuned plate circuit that consists of the primary winding of transformer T401 and capacitor C401. The if. signal is induced into the secondary winding of transformer T401 and is applied to second if. amplifier U202.

b. Operation of the second and third if. amplifier stages is similar to that of the first if. amplifier stage (*a* above), except that the ground return path for grid resistors R208 and R206 is completed through resistor R209. When the METER

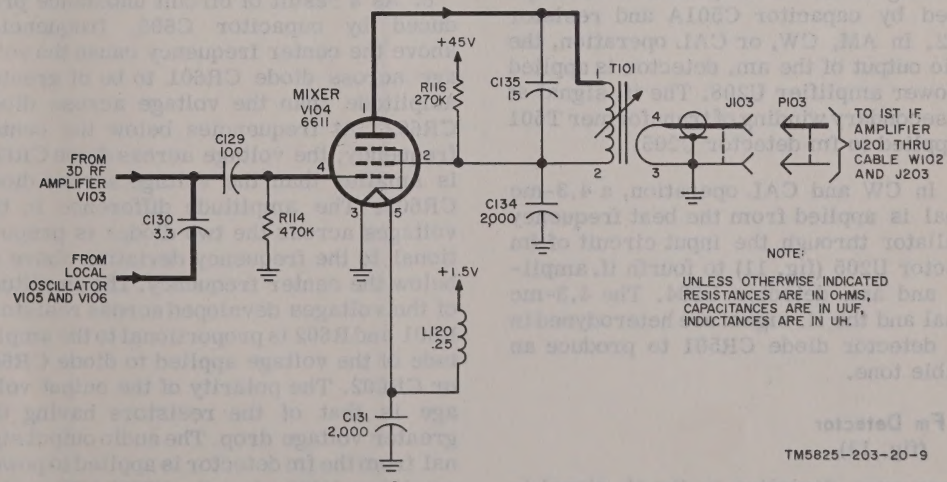


Figure 9. Mixer, schematic diagram.

switch is in the SIG position, the grid currents of the second, third, and fourth if. amplifier stages are metered to provide a visual tuning indication. The dc voltage developed across R209 by the flow of grid current is applied to meter M1 through a filter that consists of resistors R205, R204, and capacitors C205, C203, and C206, and terminal N of connectors J201 and P1.

c. The plate and screen-grid voltage for the three if. stages is applied from the RF GAIN control through terminal J of connectors P1 and J201. Additional plate decoupling is provided by resistor R203 and capacitor C204.

15. Fourth If. Amplifier and Am. Detector (fig. 10)

The signal from the third if. amplifier stage is applied to fourth if. amplifier and am. detector stage U204. The gain of the fourth if. amplifier is not adjustable as is the gain of the first, second, and third if. amplifier stages.

a. The if. signal developed across the tuned plate circuit is rectified by am. detector diode CR501. The audio is developed across resistor R503 and capacitor C503. Filtering of the if. component is accomplished by capacitor C501A and resistor R502. In AM, CW, or CAL operation, the audio output of the am. detector is applied to power amplifier U208. The if. signal at the secondary winding of transformer T501 is applied to fm detector U205.

b. In CW and CAL operation, a 4.3-mc signal is applied from the beat frequency oscillator through the input circuit of fm detector U205 (fig. 11) to fourth if. amplifier and am. detector U204. The 4.3-mc signal and the if. signal are heterodyned in am. detector diode CR501 to produce an audible tone.

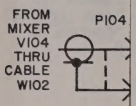
16. Fm Detector (fig. 11)

Frequency deviation in the if. signal is detected by fm detector U205. The fm detector uses two type 1N128 germanium crystal diodes.

a. The if. signal from the fourth if. amplifier U204 is applied to the series-resonant circuit that consists of variable inductor L601 and capacitor C603. The resonant circuit is tuned to the if. center frequency by variable inductor L601. The if. signal developed across capacitor C603 is coupled by capacitor C602 to the center tap of variable inductor L602. Capacitor C604 and variable inductor L602 comprise a tuned circuit. Crystal diodes CR601 and CR602 rectify the if. signal, and direct current (dc) voltages of opposite polarity are developed across load resistors R601 and R602. Capacitor C606 bypasses the if. signal to ground. Resistor R603 and capacitor C607 provide additional filtering of the audio signal and comprise a deemphasis network that attenuates the higher audio-frequencies.

b. At the if. center frequency, the voltages applied to diodes CR601 and CR602 are of equal amplitude. The voltages developed across load resistors R601 and R602 are of equal amplitude, but of opposite polarity. The voltages of equal amplitude and opposite polarity cancel each other and no output signal is developed.

c. As a result of circuit unbalance produced by capacitor C605, frequencies above the center frequency cause the voltage across diode CR601 to be of greater amplitude than the voltage across diode CR602. At frequencies below the center frequency, the voltage across diode CR601 is smaller than the voltage across diode CR602. The amplitude difference in the voltages across the two diodes is proportional to the frequency deviation above or below the center frequency. The amplitude of the voltages developed across resistors R601 and R602 is proportional to the amplitude of the voltage applied to diode CR601 or CR602. The polarity of the output voltage is that of the resistors having the greater voltage drop. The audio output signal from the fm detector is applied to power amplifier U208 when the OPERATE switch is on FM.


FROM
MIXER
V104
THRU
CABLE
W102
P104

switch is in the SIG position, the grid currents of the second, third, and fourth if. amplifier stages are metered to provide a visual tuning indication. The dc voltage developed across R209 by the flow of grid current is applied to meter M1 through a filter that consists of resistors R205, R204, and capacitors C205, C203, and C206, and terminal N of connectors J201 and P1.

c. The plate and screen-grid voltage for the three if. stages is applied from the RF GAIN control through terminal J of connectors P1 and J201. Additional plate decoupling is provided by resistor R203 and capacitor C204.

15. Fourth If. Amplifier and Am. Detector (fig. 10)

The signal from the third if. amplifier stage is applied to fourth if. amplifier and am. detector stage U204. The gain of the fourth if. amplifier is not adjustable as is the gain of the first, second, and third if. amplifier stages.

a. The if. signal developed across the tuned plate circuit is rectified by am. detector diode CR501. The audio is developed across resistor R503 and capacitor C503. Filtering of the if. component is accomplished by capacitor C501A and resistor R502. In AM, CW, or CAL operation, the audio output of the am. detector is applied to power amplifier U208. The if. signal at the secondary winding of transformer T501 is applied to fm detector U205.

b. In CW and CAL operation, a 4.3-mc signal is applied from the beat frequency oscillator through the input circuit of fm detector U205 (fig. 11) to fourth if. amplifier and am. detector U204. The 4.3-mc signal and the if. signal are heterodyned in am. detector diode CR501 to produce an audible tone.

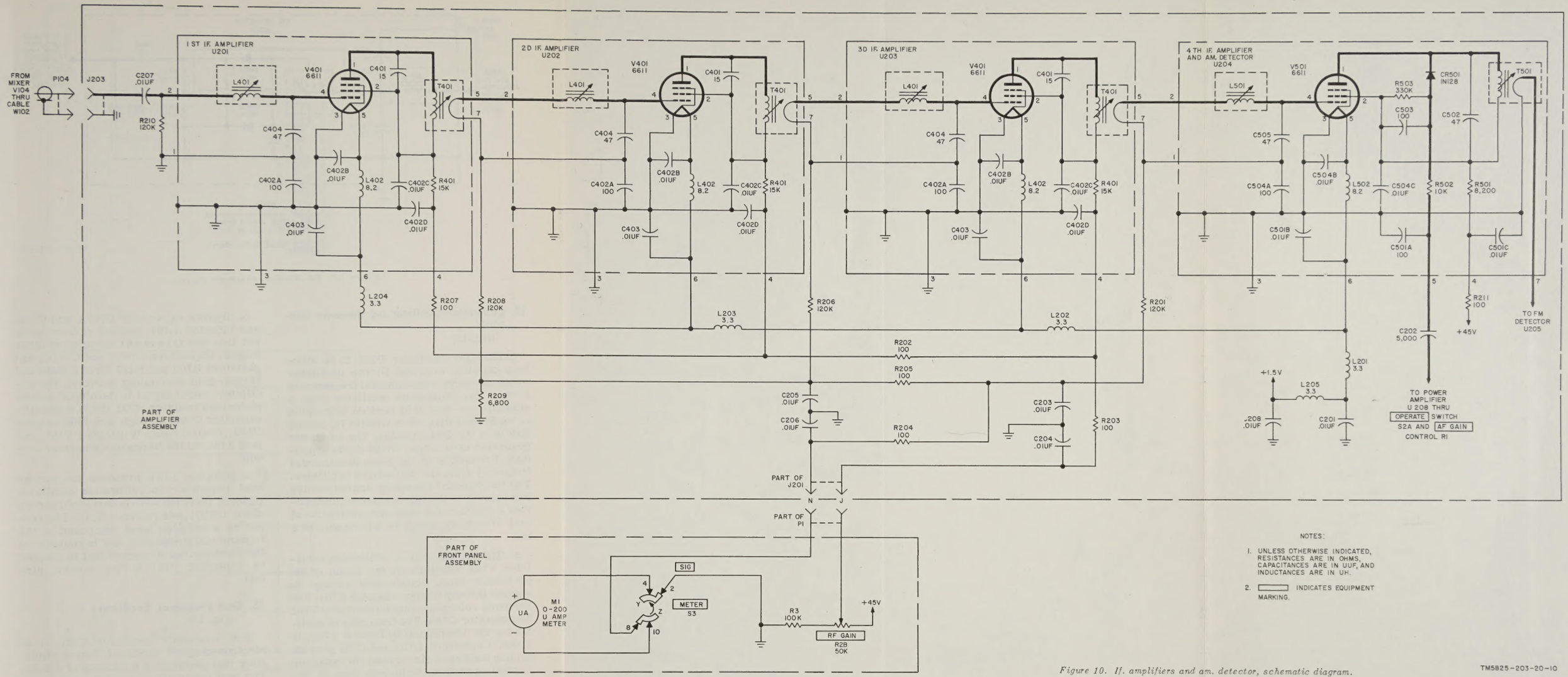
16. Fm Detector (fig. 11)

Frequency deviation in the if. signal is detected by fm detector U205. The fm detector uses two type 1N128 germanium crystal diodes.

a. The if. signal from the fourth if. amplifier U204 is applied to the series-resonant circuit that consists of variable inductor L601 and capacitor C603. The resonant circuit is tuned to the if. center frequency by variable inductor L601. The if. signal developed across capacitor C603 is coupled by capacitor C602 to the center tap of variable inductor L602. Capacitor C604 and variable inductor L602 comprise a tuned circuit. Crystal diodes CR601 and CR602 rectify the if. signal, and direct current (dc) voltages of opposite polarity are developed across load resistors R601 and R602. Capacitor C606 bypasses the if. signal to ground. Resistor R603 and capacitor C607 provide additional filtering of the audio signal and comprise a deemphasis network that attenuates the higher audio-frequencies.

b. At the if. center frequency, the voltages applied to diodes CR601 and CR602 are of equal amplitude. The voltages developed across load resistors R601 and R602 are of equal amplitude, but of opposite polarity. The voltages of equal amplitude and opposite polarity cancel each other and no output signal is developed.

c. As a result of circuit unbalance produced by capacitor C605, frequencies above the center frequency cause the voltage across diode CR601 to be of greater amplitude than the voltage across diode CR602. At frequencies below the center frequency, the voltage across diode CR601 is smaller than the voltage across diode CR602. The amplitude difference in the voltages across the two diodes is proportional to the frequency deviation above or below the center frequency. The amplitude of the voltages developed across resistors R601 and R602 is proportional to the amplitude of the voltage applied to diode CR601 or CR602. The polarity of the output voltage is that of the resistors having the greater voltage drop. The audio output signal from the fm detector is applied to power amplifier U208 when the OPERATE switch is on FM.



NOTES:

1. UNLESS OTHERWISE INDICATED, RESISTANCES ARE IN OHMS, CAPACITANCES ARE IN UUF, AND INDUCTANCES ARE IN UH.
2. ▭ INDICATES EQUIPMENT MARKING.

Figure 10. If. amplifiers and am. detector, schematic diagram.

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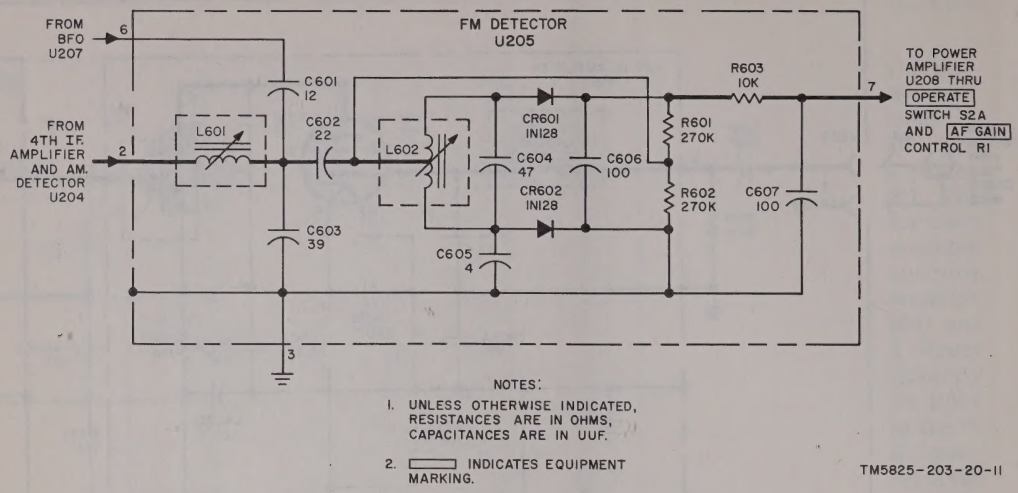


Figure 11. Fm detector, schematic diagram.

17. Calibration Oscillator and Harmonic Generator

(fig. 12)

Calibration oscillator U206 is an electron-coupled, modified Pierce oscillator which produces a fundamental frequency of 2 mc. The calibration oscillator uses a subminature-type 6611 pentode tube which is made operative when OPERATE switch S2B is in the CAL position. The harmonic generator uses a type 1N198 diode to produce harmonics of the 2-mc fundamental frequency from the calibration oscillator. The fundamental frequency and harmonics are applied to the antenna circuit, and provide a check of the receiver calibration at each frequency which is a harmonic of 2 mc.

a. The screen grid of calibration oscillator V701 functions as the anode of the oscillator tube. Screen-grid voltage is applied through screen resistor R704. The feedback voltage is coupled to crystal Y701 by capacitor C703. The frequency of oscillation, as determined by crystal Y701, is 2 mc. Capacitors C701 and C702 provide proper loading of the crystal for optimum crystal operation. Grid-leak bias is developed across capacitor C702 and resistor R701.

b. Bypass capacitors C705A and C706, and inductor L701 prevent rf from being fed into the filament circuits of other stages. Capacitors C705B and C705C, and resistors R703 and R212 form a plate and screen-grid decoupling network. The oscillator output signal is developed across plate-load resistor R702 and is coupled by capacitor C704, through jack J202 and plug P102, coaxial cable W101, plug P101, and jack J101, to the harmonic generator circuit.

c. Inductor L101 presents the proper load impedance to calibration oscillator U206. A rectified wave is developed across diode CR101 and resistor R119. The output is a complex wave composed of the fundamental frequency and harmonics of the fundamental frequency that is coupled by capacitor C101 to the antenna circuit.

18. Beat Frequency Oscillator

(fig. 13)

Beat frequency oscillator U207 is an electron-coupled modified Pierce oscillator that produces a frequency of 4.3 mc. The beat frequency oscillator stage uses a subminature-type 6611 pentode tube which is made operative when OPERATE switch

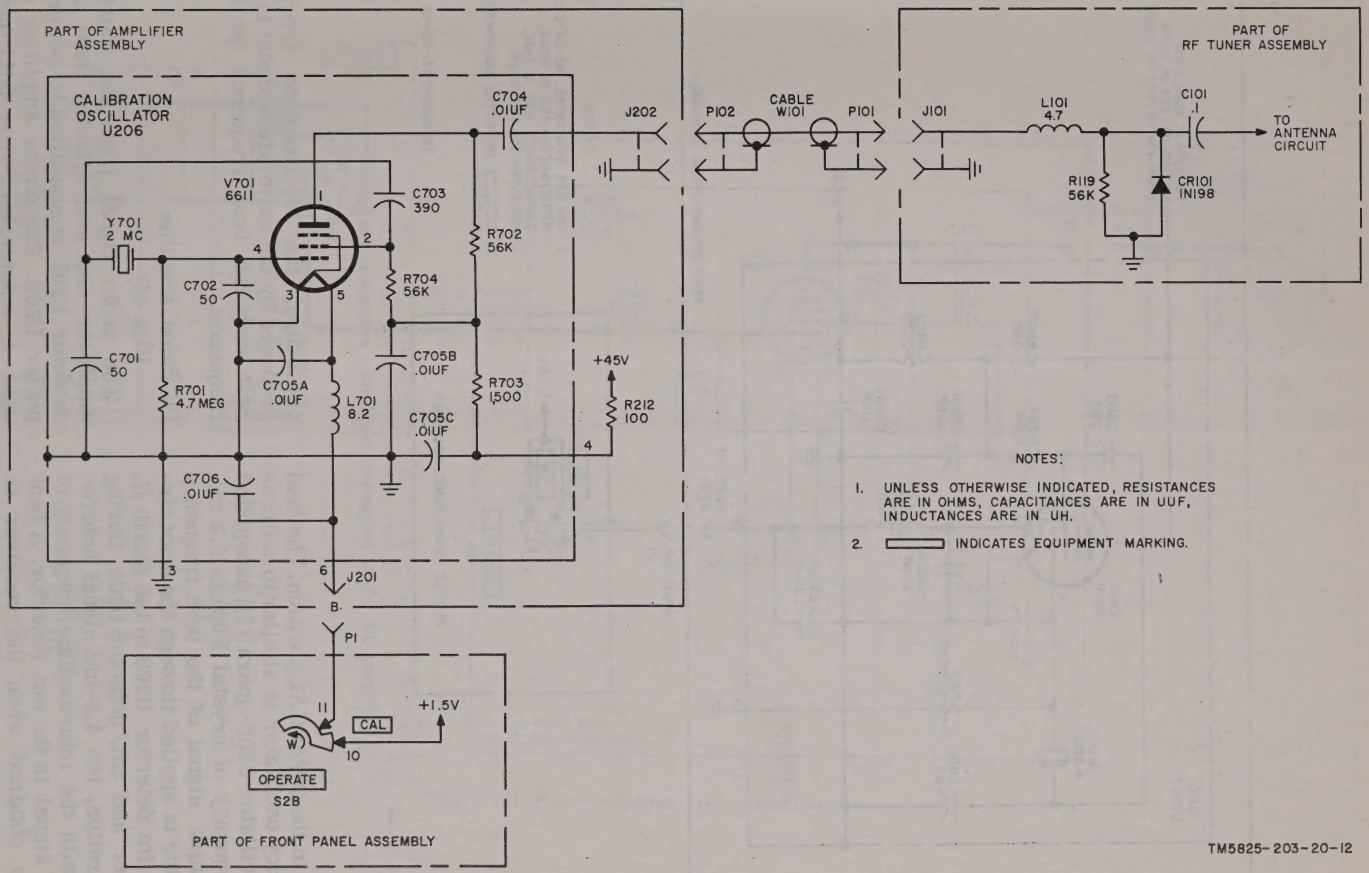


Figure 12. Calibration oscillator and harmonic generator, schematic diagram.

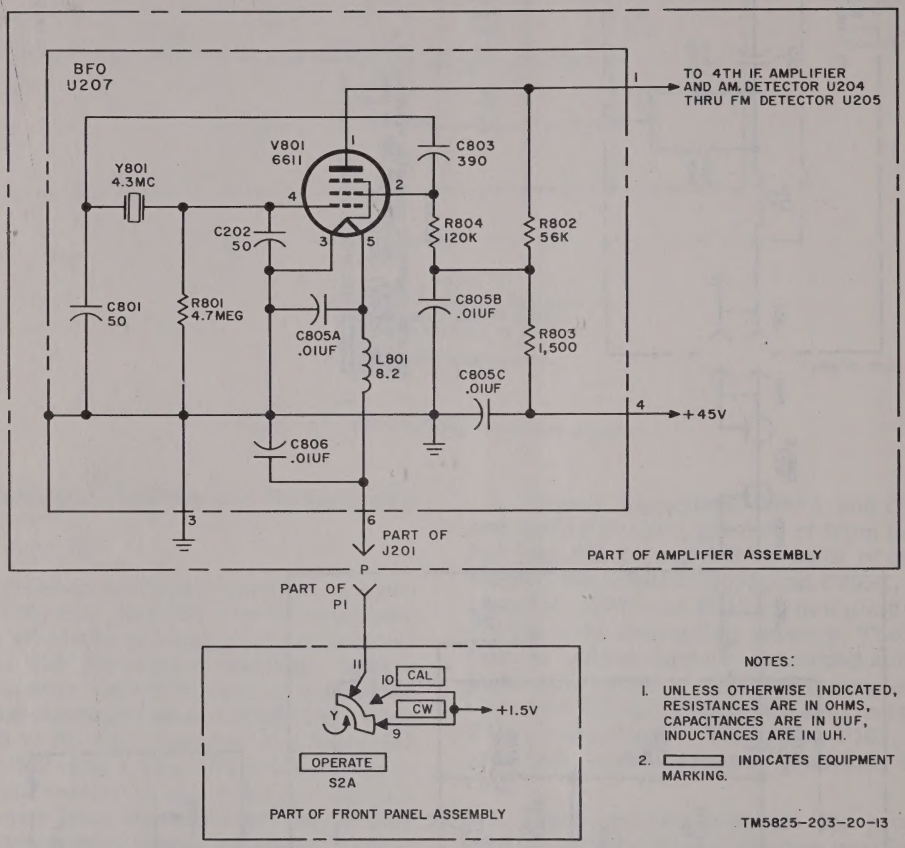


Figure 13. Beat frequence oscillator, schematic diagram.

S2A is in the CW or CAL position. The beat frequency oscillator is similar to calibration oscillator U206 (para 17), except that the frequency of crystal Y801 is 4.3 mc. The output signal of the beat frequency oscillator is applied through the input circuit of fm detector U205 to the fourth if. amplifier and am. detector U204. During cw operation, the 4.3-mc signal heterodynes with the intermediate frequency of the cw signal in the am. detector. A beat note is obtained when the receiver is slightly detuned. During the calibration procedure, the intermediate frequency produced by the calibration signal is zero beat with the beat frequency oscillator frequency.

19. Power Amplifier
(fig. 14)

The audio signal from the fourth if. amplifier and am. detector U204 or fm detector U205 is amplified by power amplifier U208. The power amplifier stage uses a subminature-type 6611 pentode tube.

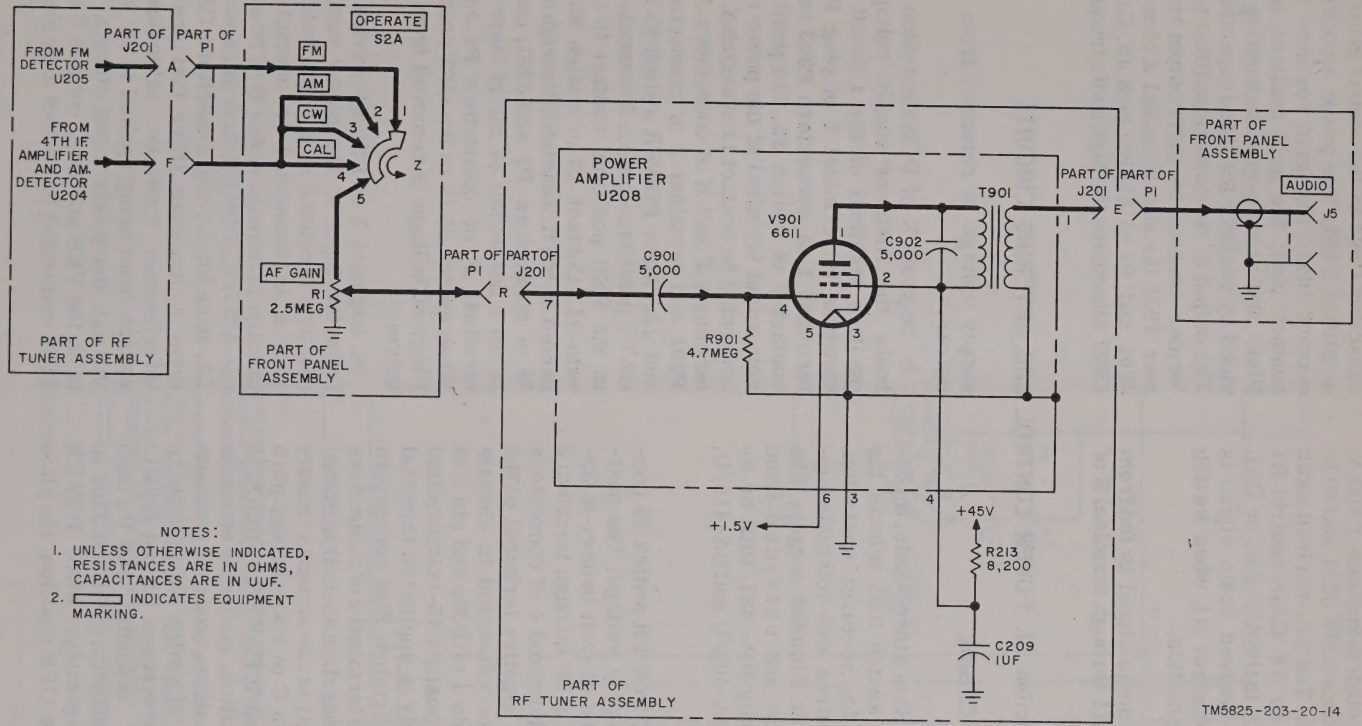


Figure 14. Power amplifier, schematic diagram.

a. The audio signal from the am. or fm detector is fed through terminals F and A, respectively, of connectors J201 and P1 to switch section S2A. The am.-derived audio signal is applied to AF GAIN control R1 when switch S2A is in the AM, CW, or CAL position. The fm-derived audio signal is fed to AF GAIN control R1 when switch S2A is in the FM position.

b. The selected audio signal is fed from AF GAIN control R1 through terminal R of connectors P1 and J201 and coupled by capacitor C901 to the control grid of power amplifier V901. The power amplifier uses contact bias; the grid resistor is R901 contact bias; the grid resistor is R901. Plate and screen-grid decoupling is provided by resistor R213 and capacitor C209. The output of the power amplifier is transformer coupled by audio output transformer T901 through terminal E of connector J201 and P1 to AUDIO jack J5. Capacitor C902 attenuates the high audio frequencies.

Section III. POWER CONTROL AND METERING CIRCUITS

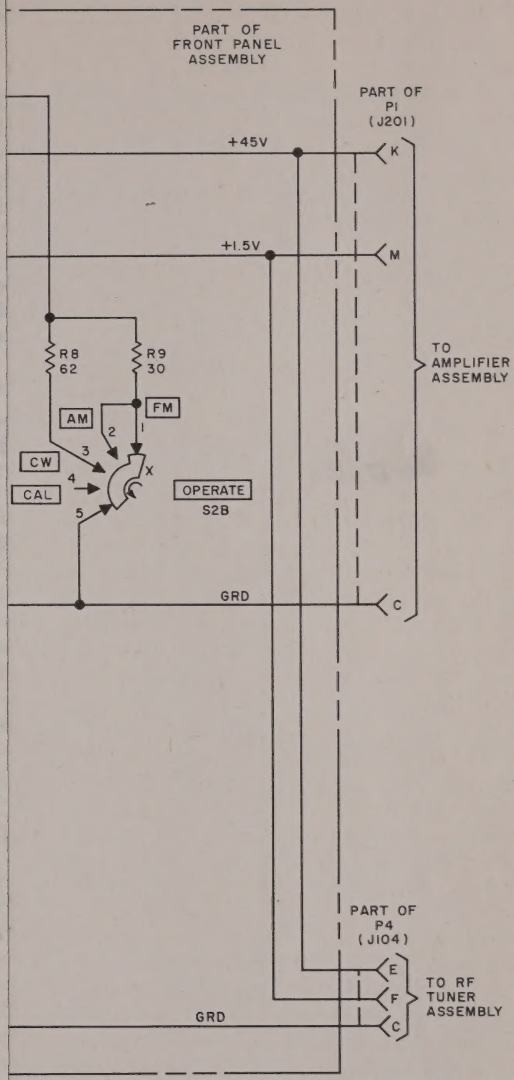
20. Power Control Circuits (fig. 15)

POWER switch S5 is a three-pole, three-position rotary switch that selects the source of power for receiver operation. The receiver requires a 45-volt plate supply and a 1.5-volt filament supply. The operating voltages are obtained from either Power Supply PP-1481/PRR or A- and B-batteries BA-403/U and BA-418/U, respectively.

a. Segment Y of POWER switch S5 controls the plate supply voltage. The positive terminal of the 45-volt battery is applied to contact 4 of S5 through terminal 3 of plug P304 and terminal 4 of connectors P303 and J3. The negative terminal of the 45-volt battery is connected to chassis ground through pin 1 of P304 and pin 5 of P303 and J3. The positive 45-volt terminal of the power supply is applied to terminal 8 of S5 through terminal E of connectors J301 and P301 and terminal 3 of connectors P303 and J3. The negative 45-volt terminal of the power supply is connected to chassis ground through pin C of P301 through pin 5 of P303 and J3. When POWER switch S5 is in the BATT position, contact 4 connects with 5; in VEH position, contact 8 connects with 5. Contact 5 of switch S5 connects to terminal K of connectors P1 and J201 to the if. amplifier assembly and through terminal E of connectors P4 and J104 to the rf tuner assembly. When POWER switch S5 is in the OFF position, the plate supply voltage is removed from the receiver.

b. Segment X of POWER switch S5 controls the filament supply voltage. The positive terminal of the 1.5-volt battery connects to terminal 2 of plug P302 and terminal 1 of connectors P303 and J3, to contact 9 of switch S5. The positive 1.5-volt output terminal of the power supply is connected to contact 11 of switch 5, through terminals F and H of connectors J301 and P301 and terminal 2 of connectors P303 and J3. When POWER switch S5 is in the BATT position, contact 9 connects with 10; in the VEH position, contact 10 connects with 11. Contact 10 of switch S5 is connected to the if. assembly through terminal M of connectors P1 and J201; contact 10 is also connected to the rf tuner through terminal F of connectors P4 and J104. When switch S5 is in the OFF position, the filament voltage is removed from the receiver.

c. Segment Z of POWER switch S5 controls the input to the power supply. The positive terminal of the vehicular power source is connected to contact 3 of S5 through terminals A and B of Power Cable CX-4377/U, POWER jack J4, and inductor L1. Inductor L1 and capacitors C2 and C1 form a low-pass filter that prevents rf interference from the vehicular power source from being applied to the receiver through the power input circuit. When S5 is in the VEH position, contact 3 of switch S5 is connected to contact 2 by segment Z.



TES:

UNLESS OTHERWISE INDICATED, RESISTANCES ARE IN OHMS, CAPACITANCES ARE IN UUF, INDUCTANCES ARE IN UH.

WAFER SWITCHES ARE SHOWN IN EXTREME COUNTER-CLOCKWISE POSITION OF CONTROL KNOB, AND VIEWED FROM REAR. FRONT OF WAFER IS SIDE TOWARD CONTROL KNOB. WAFER NEAREST CONTROL KNOB IS SECTION A. SEGMENTS OF WAFERS ARE IDENTIFIED: W, X, Y, Z.

▭ INDICATES EQUIPMENT MARKING.

TM5825-203-20-15

agram.

a. The audio signal from the am. or fm detector is fed through terminals F and A, respectively, of connectors J201 and P1 to switch section S2A. The am.-derived audio signal is applied to AF GAIN control R1 when switch S2A is in the AM, CW, or CAL position. The fm-derived audio signal is fed to AF GAIN control R1 when switch S2A is in the FM position.

b. The selected audio signal is fed from AF GAIN control R1 through terminal R of connectors P1 and J201 and coupled by capacitor C901 to the control grid of power amplifier V901. The power amplifier uses contact bias; the grid resistor is R901 contact bias; the grid resistor is R901. Plate and screen-grid decoupling is provided by resistor R213 and capacitor C209. The output of the power amplifier is transformer coupled by audio output transformer T901 through terminal E of connector J201 and P1 to AUDIO jack J5. Capacitor C902 attenuates the high audio frequencies.

Section III. POWER CONTROL AND METERING CIRCUITS

20. Power Control Circuits (fig. 15)

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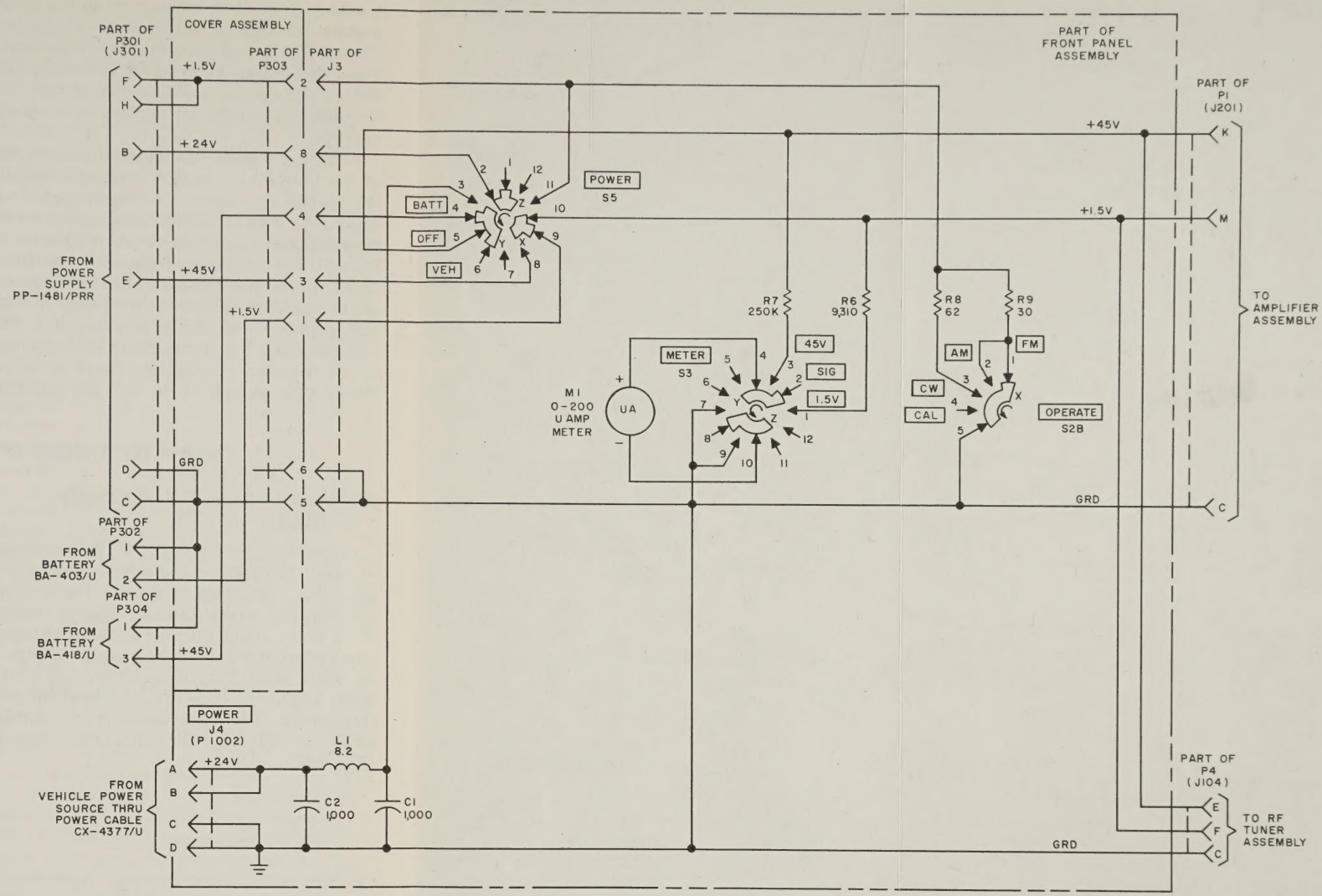
c. Segment Z of POWER switch S5 controls the input to the power supply. The positive terminal of the vehicular power source is connected to contact 3 of S5 through terminals A and B of Power Cable CX-4377/U, POWER jack J4, and inductor L1. Inductor L1 and capacitors C2 and C1 form a low-pass filter that prevents rf interference from the vehicular power source from being applied to the receiver through the power input circuit. When S5 is in the VEH position, contact 3 of switch S5 is connected to contact 2 by segment Z.



NOTES:

1. POWER switch shown in BATT position.
2. METER switch shown in SIG position.
3. OPERATE switch shown in FM position.
4. Unless otherwise indicated, resistances are in ohms, capacitances are in uuf, inductances are in uh.
5. Wafer switches are shown in extreme counter-clockwise position of control knob, and viewed from rear. Front of wafer is side toward control knob. Wafer nearest control knob is section A. Segments of wafers are identified: W, X, Y, Z.
6. ▭ indicates equipment marking.

TM5825-203-20-15

Figure 15. Power control and metering circuits, schematic diagram.

Contact 2 of S5 is connected to the power supply through terminal 8 of connectors J3 and P303, and terminal B of connectors P301 and J301. When POWER switch S5 is set to either the OFF or BATT position, the input power is not applied to the power supply.

d. In the FM or AM position, section S2B of the OPERATE switch connects resistor R9 across the filament voltage supply from the power supply. This compensates for the deenergized filaments of calibration oscillator U206 and beat frequency oscillator U207. In the CW position, switch S2B connects resistor R8 across the filament voltage supply from the power supply. This compensates for the deenergized filament of calibration oscillator U206 when the OPERATE switch is in the CW position.

21. Metering Circuit
(fig. 15)

a. When the METER switch S3 is in the SIG position, the meter measures if. amplifier grid current (para 14). METER switch S3 is a two-pole, three-position rotary switch which is spring loaded to the SIG position.

b. When the METER switch is in the 45V position, meter M1 is connected across the plate voltage supply through voltage multiplier resistor R7.

c. When the METER switch is in the 1.5V position, meter M1 is connected across the filament supply through multiplier resistor R6.

Section IV. THEORY OF POWER SUPPLY PP-1481/PRR

22. Block Diagram of Power Supply
(fig.16)

Power Supply PP-1481/PRR is a miniaturized, transistorized power source that provides operating voltages for the receiver. The power supply requires an input of 24 volts at 150 milliamperes. The power supply provides a plate supply voltage of 45 volts at 17.5 milliamperes, and a filament supply voltage of 1.5 volts at 500 milliamperes. For complete circuit details, refer to the overall schematic diagram (fig. 17).

a. The input voltage from the power source is regulated by input voltage regulator Q301. The saturation oscillator converts the input to a square wave that has a frequency of 7.5 kilocycles per second (kc/s).

b. The output voltage for the plate supply is rectified by diodes CR302 through CR305 and is filtered to provide 45 volts dc.

c. The output voltage for the filament supply is rectified by diodes CR306 and CR307 and is filtered to provide the dc

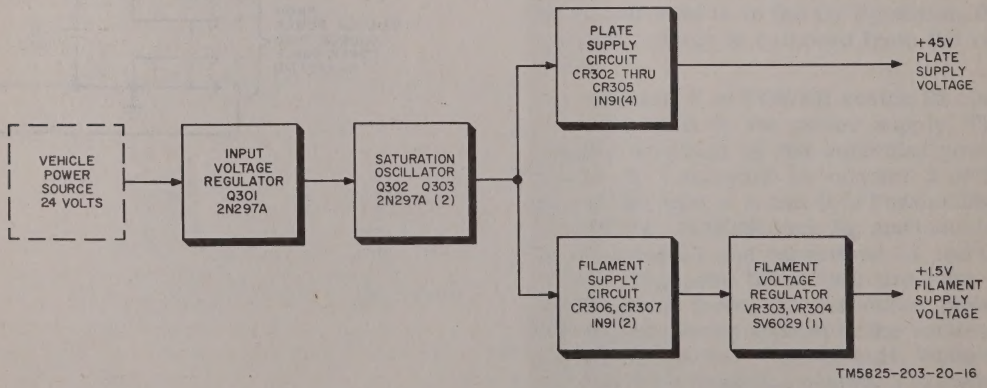


Figure 16. Power Supply PP-1481/PRR, block diagram.

filament voltage. Filament voltage regulators VR303 and VR304 maintain a constant 1.5-volt filament supply.

23. Input Voltage Regulator (fig. 17)

Input voltage regulator Q301 is a type 2N297A power transistor operated with Zener diode voltage regulators VR301 and VR302. The 24-volt input from the vehicular power source is regulated by input voltage regulator Q301 at 18 volts for the operation of saturation oscillator Q302 and Q303.

a. The positive terminal of the vehicular power supply is connected to B of plug J301, through filter choke L301, fuse F301, and germanium diode CR301, to the input voltage regulator. Fuse F301 protects the power supply from overload. Diode CR301 prevents current from flowing if the polarity of the input is accidentally reversed. Capacitor C301 and inductor L301 prevent the 7.5-kc/s oscillator signal from entering the 24-volt power source. The dc input voltage is applied across Zener diodes VR301 and VR302, and series resistor R301. Resistor R301 limits the diode current within the proper range. The base of transistor Q301 is held at a constant -18 volts with respect to the junction of diode CR301 and capacitor C301. This is accomplished by Zener diodes VR301 and VR302.

b. The saturation oscillator is connected between the emitter of regulator Q301 to the junction of diode CR301 and capacitor C301. The potential difference between the emitter and base of Q301 is esentially constant. An increase or decrease of the input voltage causes the same voltage increase or decrease at both the emitter and the base. The input voltage increase or decrease causes the same increase or decrease of the potential between the collector and emitter because the base current is constant. The collector-to-emitter impedance is effectively a variable resistance which is in series with the saturation oscillator, and which varies directly as the input voltage. Capacitor C302 filters the switching transients of the saturation oscillator.

24. Saturation Oscillator (fig. 17)

Saturation oscillator Q302 and Q303 converts the regulated 18 volts from the input voltage regulator to a square wave that has a frequency of 7.5 kc/s. The oscillator uses two type 2N297A switching power transistors.

a. When an 18-volt potential is applied between the collector and emitter of transistors Q302 and Q303, one of the transistors conducts more than the other transistor. Assume that transistor Q302 conducts more than transistor Q303. The magnetic field produced in transformer T301 by transistor Q302 collector current is greater than the magnetic field produced by transistor Q302 collector current. The magnetic field produced by transistor Q302 collector current induces a voltage in the transformer T301 windings connected to the emitters of transistors Q302 and Q303. The induced voltage applied to the emitter of transistor Q302 aids the 18 volts. The induced voltage applied to the emitter of transistor Q302 increases and develops a larger voltage across resistor R302. Transistor Q303 is cut off because the emitter becomes less positive than the base.

b. When transistor Q302 reaches current saturation, the magnetic field produced in transformer T301 by transistor Q302 collector current remains constant. Induced voltages are no longer applied to the emitter of transistors Q302 and Q303. The conduction of transistor Q302 decreases, while the conduction of transistor Q303 increases. The operation is similar to that discussed in *a* above, but with the conduction of transistor Q303 increasing and transistor Q302 being cut off.

25. Plate Supply Circuit (fig. 17)

The plate supply circuit converts the alternating current (ac) voltage developed at terminals 7 and 8 of transformer T301 to 45 volts dc. Rectification is accomplished by four type 1N91 germanium crystals, CR302 through CR305, connected as a

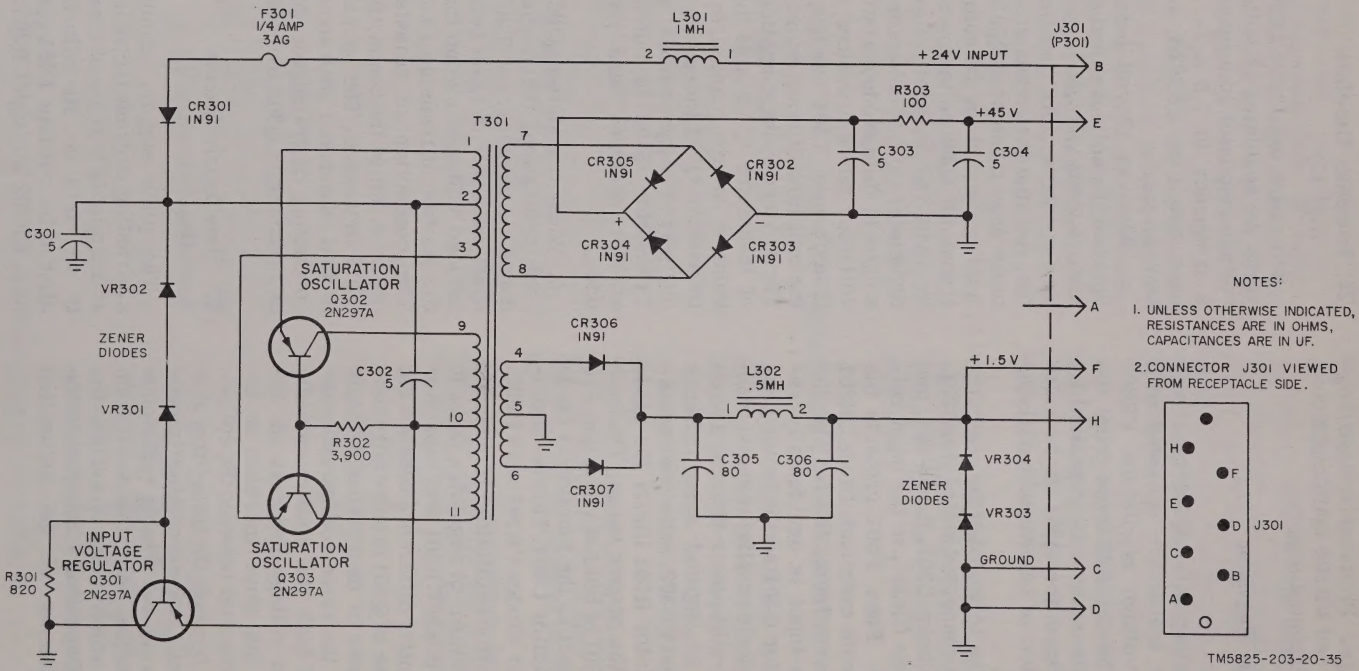


Figure 17. Power Supply PP-1481/PRR, schematic diagram.

full-wave bridge. The output of the full-wave bridge rectifier is filtered by capacitors C303 and C304, and resistor R303. The positive terminal of the plate supply is connected to terminal E of connectors J301; the negative terminal is connected to the chassis.

26. Filament Supply Circuit (fig. 17)

The filament supply circuit converts the ac voltage across terminals 4, 5, and 6 of transformer T301 to 1.5 volts dc. This is accomplished by full-wave rectifier diodes CR306 and CR307, which are type 1N91 germanium crystal diodes. The output of the full-wave rectifier is filtered by capacitors C305 and C306, and inductor L302. The output voltage is regulated by Zener diodes VR303 and VR304. The voltage regulators compensate for changes in load current and keep the output voltage constant. The positive terminal of the filament supply is connected to terminals F and H of connector J301; the negative terminal is connected to the chassis.

CHAPTER 4
MAINTENANCE INSTRUCTIONS

27. Tools and Materials Required

A list of parts normally stocked for organizational maintenance is contained in TM 11-5825-203-20P. The tools and materials required for preventive maintenance are listed below.

a. Tools.
(1) Tool Equipment TE-113.
(2) Allen wrenches No. 4, 6, and 10 (stored in spare parts kit).

b. Materials.
(1) Cleaning Compound (Federal stock No. 7930-395-9542).
(2) Orangestick.
(3) Cleaning cloth.
(4) Sandpaper, #000.
(5) Rubber tape.
(6) Friction tape.

28. Preventive Maintenance Form

a. DA Form 11-238. DA Form 11-238 (fig. 18 and 19) is a preventive maintenance checklist to be used by the unit repairman. Items not applicable to the equipment are lined out in the figure. References in the ITEM block in the figure are to paragraphs that contain additional maintenance information pertinent to the particular item. Instructions for the use of the form appear on the front of the form.

b. Items. The information given in this subparagraph is supplementary to DA Form 11-238. The item numbers correspond to the ITEM numbers on the form.

Item	Maintenance procedure
15	Remove receiver from cover assembly (case) and check seating of pluck-out units and tubes.
18	Remove covers from rf tuner and amplifier assemblies and inspect all resistors.
22	Remove power supply from cover assembly; then remove power supply cover and inspect transformer and chokes.
25	Inspect rubber gasket behind front panel.

ADDITIONAL ITEMS FOR 2D AND 3D ECHELON INSPECTIONS	CONDITION
26. INSPECT ANTENNA FOR ECCENTRICITIES, CORROSION, LOOSE FIT, DAMAGED INSULATORS ~~AND REFLECTORS~~.	✓
27. CHECK FOR NORMAL OPERATION.	✓
28. BEFORE SHIPPING OR STORING, REMOVE BATTERIES	✓

IF DEFICIENCIES NOTED ARE NOT CORRECTED DURING THE INSPECTION, INDICATE ACTION TAKEN FOR CORRECTION.

8 JANUARY

ITEMS 1 AND 7. POWER CORD CUT. REPORTED TO 2D ECHELON. - M. CARPENTER

9 JANUARY POWER CORD REPAIRED - S RAY

FOLD

MAINTENANCE CHECK LIST FOR SIGNAL EQUIPMENT
SOUND EQUIPMENT, RADIO, DIRECTION FINDING
RADAR, CARRIER, RADIOSONDE AND TELEVISION
(AR 750-625)

EQUIPMENT NOMENCLATURE
RECEIVER GROUP OA-1451/PRR

EQUIPMENT SERIAL NUMBER
000

INSTRUCTIONS

This form may be used for a period of one month by using the correct dates and weeks of the month. It is to be used as a Preventive Maintenance check list for Signal equipment in actual use, or for a check on equipment prior to issue.

1. For detailed Preventive Maintenance instructions see:
   a. The Technical Manual *(in TM 11 series)* for the equipment. *(See DA Pamphlet Number 310-4)*
   b. The Supply Bulletin *(SB 11-100 series)* for the equipment. *(See DA Pamphlet Number 310-4)*
   c. The Department of the Army Lubrication Order. *(See DA Pamphlet Number 310-4)*

2. The following action will be taken by either the Communications Officer/ Chief for 1st echelon, or the Inspector for higher echelon:
   a. Enter Equipment Nomenclature and Serial Number.
   b. Strike out items that do not apply to the equipment.

3. Operator/Inspector will enter in the columns entitled CONDITION, on the proper line, a notation regarding the condition, using symbols specified under LEGEND.

4. After operator completes each daily inspection he will initial over the appropriate dates under "Daily Condition for Month", then return form to his supervisor.

TYPE OF INSPECTION

OPER-ATOR	2/3 ECH-ELON	DATE	SIGNATURE
✓		1 January	Michael Carpenter
	✓	10 January	Stephen Ray

Figure 18. DA Form 11–238, pages 1 and 4.

DA FORM 1 MAY 57 11-238

REPLACES DA FORMS 11-238, 1 NOV 55; 11-239, 11-244, 11-245, 11-248, 11-249, 11-250, AND 11-251; WHICH ARE OBSOLETE.

LEGEND for marking conditions:
Satisfactory, ✓.
Adjustment, Repair or Replacement required, X.
Defect corrected, (X).

DAILY CONDITION FOR MONTH OF JANUARY

NO.	DAILY ITEM	1 MC 17	2 MC 18	3 MC 19	4 MC 20	5 MC 21	6 MC 22	7 MC 23	8 MC 24	9 MC 25	10 MC 26	11 MC 27	12 MC 28	13	14	15	16	2D 3D ECH-ELON
1.	COMPLETENESS AND GENERAL CONDITION OF EQUIPMENT. (~~Transmitter~~, receiver, carrying cases~~)~~, wire, cables, ~~microphones~~, tubes, spare parts, technical manuals).	✓	✓	✓	✓	✓	✓	✓	(X)	✓	✓	✓	✓					
2.	CLEAN DIRT AND MOISTURE FROM ANTENNA, MICRO-~~PHONES~~, HEADSETS, ~~KEYS~~, JACKS, PLUGS, COMPONENT PANELS.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓					
3.	INSPECT CONTROLS FOR NORMAL OPERATION. TAP CONTROLS LIGHTLY FOR EVIDENCE OF CUT-OUT FROM LOOSE CONTACTS.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓					
4.	CHECK FOR NORMAL OPERATION OF EQUIPMENT. BE ALERT FOR UNUSUAL OPERATION OR CONDITION.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓					

WEEKLY	CONDITION EACH WEEK 1ST	2D	3D	4TH	5TH	2D 3D ECH
5. CLEAN AND TIGHTEN EXTERIORS OF CASES, ~~RACKS~~, MOUNTS, ~~TRANSMISSION LINES~~.	✓	✓				✓
6. INSPECT CASES, MOUNTS, ANTENNA ~~TOWERS~~ AND EXPOSED METAL SURFACES FOR RUST, CORROSION.	✓	✓				✓
7. INSPECT CORDS, CABLE, WIRE, SHOCK MOUNTS FOR CUTS, KINKS, BREAKS, FRAYING, UNDUE STRAIN.	✓	(X)				✓
8. ~~CHECK ANTENNA GUY WIRES FOR PROPER TENSION OR DAMAGE~~.						
9. INSPECT CANVAS AND LEATHER ITEMS FOR MILDEW, TEARS, FRAYING.	✓	✓				✓
10. INSPECT ACCESSIBLE ITEMS FOR LOOSE-NESS: SWITCHES, KNOBS, JACKS, CONNECTORS, ~~RELAYS~~, TRANSFORMERS, ~~MOTORS~~, PILOT LIGHTS, ~~BLOWERS~~, ETC.	✓	✓				✓
11. CLEAN AND/OR INSPECT ~~AIR FILTERS~~, BRASS NAME PLATES, DIAL AND METER WINDOWS.	✓	✓				✓
12. ~~INSPECT STORAGE BATTERIES FOR DIRT, LOOSE TERMINALS, SPECIFIC GRAVITY, DAMAGED CASES. INSPECT DRY BATTERIES FOR LEAKAGE.~~						

ADDITIONAL ITEMS FOR 2D AND 3D ECHELON INSPECTIONS	CONDITION
13. ~~INSPECT SHELTERS AND COVERS FOR ADEQUACY OF WEATHER PROOFING, TEARS, FRAYING.~~	
14. ~~CHECK TERMINAL BOX COVERS FOR CRACKS, DIRT, LEAKS, DAMAGED GASKETS, GREASE.~~	

ADDITIONAL ITEMS FOR 2D AND 3D ECHELON INSPECTIONS	CONDITION
15. INSPECT SEATING OF READILY ACCESSIBLE PLUCK-OUT ITEMS: TUBES, LAMPS, FUSES~~, CRYSTALS~~, CONNECTORS, ~~VIBRATORS, PLUG-IN COILS~~. PARA 28b	✓
16. ~~INSPECT RELAYS AND CIRCUIT BREAKERS FOR LOOSE MOUNTINGS, BAD CONTACTS, MIS-ALINEMENT OF CONTACTS AND SPRINGS, PROPER SPRING TENSION~~.	
17. INSPECT VARIABLE CAPACITORS FOR DIRT, ~~MIS-ALINEMENT OF PLATES~~, LOOSE MOUNTINGS, MOISTURE.	✓
18. INSPECT RESISTORS, BUSHINGS AND INSULATORS FOR CRACKS, CHIPPING, BLISTERING, MOISTURE, DISCOLORATION. PARA 28b	✓
19. CLEAN AND TIGHTEN SWITCHES, TERMINAL BLOCKS, ~~BLOWERS, RELAY CASES~~ AND INTERIORS OF CHASSIS AND CABINETS NOT READILY ACCESSIBLE.	✓
20. INSPECT TERMINAL BLOCKS FOR LOOSE CONNECTIONS, CRACKS AND BREAKS.	✓
21. INSPECT TERMINALS OF LARGE FIXED CAPACITORS AND RESISTORS FOR DIRT, CORROSION, LOOSE CONTACTS.	✓
22. INSPECT TRANSFORMERS, CHOKES, POTENTIOMETERS ~~AND RHEOSTATS~~ FOR OVERHEATING~~, AND OIL LEAKAGE~~. PARA 28b	✓
23. ~~INSPECT GENERATORS, AMPLIDYNES, DYNA-MOTORS FOR BRUSH WEAR, SPRING TENSION, ARCING AND FITTING OF COMMUTATOR~~.	
24. ~~INSPECT CATHODE RAY TUBES FOR BURNT SCREEN SPOTS.~~	
25. INSPECT WATERPROOF GASKETS FOR LEAKS, WORN OR LOOSE PARTS. PARA 28b	✓

CONTINUED ON PAGE 4

2 3

Figure 19. DA Form 11–238, pages 2 and 3.

☆ GPO: 1957 O—427034

CHAPTER 5
TROUBLESHOOTING

Section I. GENERAL TROUBLESHOOTING PROCEDURES

29. General Instructions

The troubleshooting procedures in this manual are systematically arranged to provide detailed and comprehensive coverage of the receiver group. The troubleshooting procedures, which begin with the operational check at the operator's level, are expanded through the use of an equipment performance checklist and sectionalizing, localizing, and isolating techniques.

30. Organization of Troubleshooting Procedures

a. General. The first step in troubleshooting a defective receiver is to sectionalize the fault. Sectionalization means tracing the fault to a major component: the receiver or the power supply. Localization means tracing the fault to a defective part responsible for the abnormal condition. Some faults, such as burned-out resistors, arcing, and shorted transformers can often be located by sight, smell, and hearing. The majority of faults, however, must be isolated by the process of checking voltages and resistances.

b. Sectionalization. Listed below is a group of tests arranged to reduce unnecessary work and to aid in tracing trouble in the receiver. Receiver Group OA-1451/PRR consists of two major electronic components: the receiver, and the power supply. Proceed as follows to locate the unit at fault:

(1) *Visual inspection.* The purpose of visual inspection is to locate faults without testing or measuring circuits. Observe all meter readings or other visual signs and attempt to sectionalize the fault to either of the two units.

(2) *Operational tests.* Operational tests frequently indicate the general location of trouble. In many instances, the tests will help to determine the exact nature of the fault. The equipment performance checklist (para 33*b*) is a good operational test.

c. Localization. The tests listed below will aid in isolating troubles. First, localize the trouble to a single stage or circuit; then isolate the trouble within that circuit by voltage and resistance measurements. Use the following methods to localize trouble:

(1) *Voltage and resistance measurements.* The power supply is transistorized. Observe all cautions given to prevent transistor damage. Make voltage and resistance measurements in this equipment *only as specified.* When measuring voltages, use tape or sleeving to insulate the entire test prod, except for the extreme tip. A momentary short circuit can ruin the transistor. Use resistor and capacitor color codes (fig. 32 and 33) to determine the value of the components. Use voltage and resistance diagrams (fig. 26, 29, and 30) to find normal readings, and compare them with the readings taken.

(2) *Troubleshooting chart.* The trouble symptoms listed in the troubleshooting chart (para 38*d* and 46*d*) will aid in localizing trouble to a component part.

(3) *Stage gain chart.* Stage-gain data (para 40) will help to locate hard-to-find troubles in the individual stage or circuit.

(4) *Intermittent troubles.* In all these tests, do not overlook the possibility of intermittent troubles. If present, this type of trouble often may be made to appear by tapping or jarring the equipment. Check the wiring and connections to the receiver subassemblies.

(5) *Signal substitution.* Signal substitution procedures (para 39) enable the repairman to localize a trouble to a stage quickly. Use a signal generator and an electronic voltmeter as test equipment in signal substitution procedures.

31. Test Equipment Required

The following chart lists test equipment required for troubleshooting Receiver Group OA-1451/PRR, the associated technical manuals, and the assigned common names.

Test equipment	Technical manual	Common name
Signal Generator AN/URM-48	TM 11-1257	Fm sweep generator
Signal Generator TS-497/URR	TM 11-5030	Am signal generator
Electron Tube Test Set TV-7/U	TM 11-6625-274-12	Tube tester
Multimeter AN/URM-105	TM 11-6625-203-12	Multimeter
Multimeter ME-26A/U	TM 11-6625-200-12	Vtvm
Audio Oscillator TS-382/U	TM 11-2684A	Audio oscillator
Voltmeter ME-30/U	TM 11-6625-320-12	Ac vtvm

32. Visual Inspection

When equipment failure occurs, inspect the equipment carefully before performing detailed troubleshooting procedures. This will save time and may also avoid further damage to the receiver. If possible, obtain information from the operator regarding the performance of the receiver at the time trouble occurred. Inspect for the following defects:

a. Improperly connected battery cables or power cable.

b. Worn or broken wires and disconnected or improperly seated plugs.

c. Burned-out fuse.

d. Battery failure or subnormal battery output.

e. Improperly seated or defective tubes and pluck-out units.

f. Faulty antenna connections.

Caution: **Subminiature tube replacement and testing require special techniques. Read and become thoroughly familiar with the instructions in paragraph 35 before attempting tube checks.**

33. Equipment Performance Checklist

a. General. The equipment performance checklist is a procedure used to systematically check equipment performance. When using the checklist, start at the beginning and follow each step in order. If the corrective measures indicated do not restore normal performance, refer to the troubleshooting chart (para 38*d* and 46).

b. Checklist. Allow the equipment to warm up for 5 minutes. Perform the procedures in the operator's checklist (TM 11-5825-203-10), and then those listed below.

	Step	Unit	Action	Normal indication	Corrective measures
EQUIPMENT PERF.	1	Receiver	Turn POWER switch to BATT.		
	2	Receiver	Turn and hold METER switch in 1.5V position.	Meter reads A GOOD.	Check Battery BA-403/U and connecting cable. Check connectors P303 and J3.
	3	Receiver	Turn and hold METER switch in 45V position.	Meter reads B GOOD.	Check battery BA-418/U and connecting cable. Check connectors P303 and J3.
	4	Receiver	Turn POWER switch to VEH. Hold METER switch in 1.5V position.	Meter reads A GOOD.	Check power supply fuse. Check connectors P301 and J301. Check power cable and vehicular battery.

	Step	Unit	Action	Normal indication	Corrective measures
EQUIPMENT PERFORMANCE	5	Receiver	Turn and hold METER switch in 45V position.	Meter reads B GOOD.	Localize trouble to component in power supply (para 47).
	6	Receiver	Turn LITE DIM control on.	Dial lamp lights.	Check S4 and R5.
	7	Receiver	Turn RF GAIN control to maximum clockwise position and rotate TUNING control throughout entire range.	Meter pointer deflects when TUNING control is turned through 2-mc calibration points.	Check cable W101 and connections. Check cable W102 and connections. Check U206, U201, and U202 by substitution (para 34). Check V101, V102, V103, V104, V105, and V106 (para 35). Check METER switch. Check RF GAIN control.
	8	Receiver	Turn AF GAIN control to maximum clockwise position and turn TUNING control through entire range.	Audio tone heard at all calibration points.	Check U203, U204, U207, and U208 by substitution (para 34).
	9	Receiver	Connect vhf and df antenna lead-in cables to ANT and DF ANT receptacles. Set antenna selector switch to ANT position. Set OPERATE switch to FM position. Turn RF GAIN control to maximum clockwise position. Tune receiver to an fm signal. Adjust AF GAIN control for proper level.	Fm transmission heard in headset.	Check antenna connections. Check antenna selector switch. Check cable and connectors P2 and J102. Check U205 by substitution (para 34).
	10	Receiver	Repeat step 8, but with OPERATE switch in AM position, and receiver tuned to an am. signal. Adjust RF GAIN control, as necessary.	Am. transmission heard in headset.	Check OPERATE switch.
	11	Receiver	Repeat step 8, but with OPERATE switch in CW position, and receiver tuned to a cw signal. Adjust RF GAIN control, as necessary.	Cw signal is heard in headset.	Check OPERATE switch.
	12	Receiver	Tune receiver to a cw signal; turn antenna selector switch to DF ANT position.	Cw signal is heard, but at lower level.	Check df antenna for null position. Check antenna selector switch. Check df antenna, antenna cable, and antenna cable connections.

Section II. TROUBLESHOOTING RECEIVER

34. Pluck-out Units

Hermetically sealed pluck-out units are used in all four if. stages, the fm discriminator, the bfo and calibration oscillators, and the power amplifier. Check these units by substitution. All pluck-out units are located in the amplifier assembly (fig. 2) and are made accessible by the removal of the receiver from its cover assembly. These units are plugged into sockets and may be removed by pulling them straight out after the spacer gasket has been removed. The units are color coded; a color code chart on the side of the amplifier assembly shows the proper location of each unit. Do not rock or rotate a pluck-out unit when removing or replacing it in its

socket. After replacing the pluck-out units, replace the rubber spacer gasket by placing it over the units and slipping it approximately half-way down the sides of the units.

35. Tube–Testing Techniques

The only receiver tubes that are replaceable are the three rf amplifiers, the mixer, and the two local oscillator tubes, all of which are located in the rf tuner assembly (fig. 2). All of these tubes are five-pin, flat-type subminiatures that require special techniques for removal, testing, and replacement. Before checking the tubes, read the instructions contained in this paragraph. Subminiature tubes may be damaged by careless replacement or failure to observe the color code guide when inserting them into a tube tester or a receiver.

a. Preliminary Checks.

(1) Before attempting to remove tubes, inspect all cabling, connections, and the general condition of the equipment.

(2) Isolate the trouble, if possible, to a particular section of the equipment to avoid unnecessary tube-testing substitution operations.

(3) When a tube is suspected, use the applicable procedure below to check the tube. The subminiature tubes must have their leads specially cut for replacement; therefore, the tube tester method is preferred to the tube substitution method for testing because it minimizes the cutting of the leads.

b. Use of Tube Tester.

(1) Read the operating instructions supplied with the tube tester.

(2) Remove and test one tube at a time.

(3) Read the procedures in *d* below before discarding a tube.

c. Tube Substitution. If a tube tester is not available, check the tubes by substitution. If tube substitution is performed, the new tube leads will have to be cut (*e* below).

(1) Replace the suspected tubes, one at a time, with new tubes. Note the sockets from which the original tubes are removed. If equipment becomes operative, discard the last tube removed.

(2) Reinsert all original tubes replaced by new tubes as a result of the procedure in (1) above. Reinsert one tube at a time until all remaining original tubes have been reinserted into their original sockets. Do not leave a new tube in a socket if the equipment operates satisfactorily with the original tube. If equipment failure occurs at any point during this procedure, discard the faulty original tube.

d. Discarding Tubes. Observe the following when determining whether or not a tube should be discarded:

(1) Discard a tube when the defect is obvious, such as a broken envelope, a broken lead wire, or an open filament; also discard a tube if a tube tester or the equipment indicates that tube to be definitely defective.

(2) Do not discard a tube merely because it falls on, or slightly above, the minimum acceptability value when checked in a tube tester.

(3) Do not discard a tube simply because it has a record of long service; it may, in fact, perform better than a new one; the criterion is proved operational reliability.

(4) The proved operational reliability is particularly true for tubes in oscillator circuits. Peak performance in the local oscillator, V105 and V106, may not be realized even with new tubes. Before discarding one of these tubes it should be given a careful test. When one of the tubes is discarded, select a replacement tube which most nearly matches the original tube that is to be retained.

e. Replacement of Subminiature Tubes. The six replaceable subminiature tubes in the rf tuner assembly are accessible when the receiver is withdrawn from its cover assembly. Four of these tubes are shielded by a metalized coating and have a grounding wire around the tube that is attached to one of the filament leads. The

two oscillator tubes (red-topped) are ungrounded. To remove a tube, and to prepare replacement tubes, proceed as follows:

(1) Remove the receiver from its cover assembly by loosening the six captive screws located on the front panel and by withdrawing the receiver from its cover assembly.
(2) Remove the tube retainer that is secured by a single captive screw.
(3) Slide the tube slowly and carefully out of its socket by exerting gentle finger pressure in a direction that will pull the tube straight out from its socket.

Caution: **Do not rock or twist the tube, because this may damage it.**

(4) Cut the leads of the new tube to a length of 7/32-inch.
(5) When replacing a local oscillator tube V105 and V106, use the red-topped replacement tube in the spare parts kit. If a new tube is used as the replacement, cut and remove the grounding wire around the tube. Do not cut this wire when replacing any other tube.

Note. Place the red dot on the bottom of the new tube (or the original when reinserting the same tube) next to the red dot on the chassis.

Caution: **The red dot alignment between tube and socket (or chassis) is important when checking the flat subminiature tubes in the tube tester. Failure to observe this color code alignment may cause B+ voltage to be placed on the filament instead of the plate, and may burn out the tube filament.**

(6) Insert the new tube, or reinsert the original tube straight down into the socket; use gentle finger pressure.

Caution: **Improper installation of subminiature tubes will damage them. Make sure that the tube leads are parallel to each other and that the tube leads have been cut to the proper length. A spare socket may be used to align the leads. Do not bend or force the leads.**

(7) Replace the tube retainer and tighten the captive screw.

36. Checking Receiver Filament and B+ Circuits for Shorts

a. When to Check. When any of the following conditions apply, check for short circuits and clear the troubles before applying power.

(1) When the receiver is being serviced apart from the other units of Receiver Group OA-1451/PRR, and the nature of the abnormal symptoms is not shown.
(2) When abnormal symptoms reported from operational tests indicate possible trouble in the filament of B+ circuits (items 2, 3, and 4 of the equipment performance checklist (para 33*b*)).

b. Conditions for Tests. To prepare for the short-circuit tests, proceed as follows:

(1) Disconnect and remove both batteries (TM 11-5825-203-10).
(2) Withdraw the receiver from the cover assembly (para 50).
(3) Connect the test cable between connectors J3 and P303 (fig. 20).
(4) Disconnect plug P301 from the power supply. Leave all other connectors connected.
(5) Turn the RF GAIN and AF GAIN controls to the maximum clockwise position.
(6) Turn the LITE DIM control to the OFF position.
(7) Turn the OPERATE switch to the CAL position.
(8) Turn the POWER switch to the VEH position.

c. Measurements. Make the resistance measurements indicated in the following chart. If abnormal measurements are obtained, make the additional isolating checks indicated. When the defective component is found, repair the trouble before applying power to the unit.

Caution: Ohmmeter voltages can destroy delicate vacuum-tube filaments if test leads are inadvertently touched to wrong points.

Receiver, short-circuit tests

Point of measurement	Conditions for measurement	Normal indication	Isolating procedure
Positive end (end nearest the front panel) of resistor R7 front-panel terminal board (fig. 23), to chassis ground.	Conditions as specified in *b* above.	100,000 ohms.	If more than 100,000 ohms, potentiometer R2B or resistor R3 is open. If less than 100,000 ohms, localize short as follows: Disconnect P4 (fig. 22). If resistance increases, short is in rf tuner assembly. Disconnect P1 (fig. 22). If resistance increases, short is in amplifier assembly. Disconnect test cable (fig. 20). If resistance increases, short is in cover assembly. If short is not localized short is in front-panel assembly.
	Reconnect plugs, if disconnected in step above. Turn POWER switch to BATT.	100,000 ohms.	Locate short in switch S5 or associated wiring (fig. 23).
	Turn METER switch to 45V.	70,000 ohms.	Locate short or open in switch S3, resistor R7, or associated wiring (fig. 23).
Positive end (end closest to front panel) of resistor R6, front-panel terminal board (fig. 23), to chassis ground.	Let METER switch return to SIG position. Remove all tubes (para 35) and pluck-out units (para 34).	Infinite resistance.	Localize short in manner described in first procedure above.
	Replace plugs, if disconnected in step above. Turn METER switch to 1.5V position.	9,300 ohms.	Locate open or short in switch S3, resistor R6, or associated wiring (fig. 23).
	Turn POWER switch to VEH position. Let METER switch return to SIG position.	Infinite resistance.	Locate short in switch S5 or associated wiring (fig. 23).
Terminal A of (terminal connected to L1), J4 and chassis ground (fig. 23).	Insert all tubes (para 35) and pluck-out items (para 34).	Infinite resistance.	Locate short in vehicular power input circuits on front-panel assembly.

37. Receiver Test Setup (fig. 21)

Bench tests of the receiver require connection to a power source and to various test equipments. The power source must be connected to the receiver for all dynamic servicing procedures. Make a test setup as outlined below.

a. Power Supply Connections.

(1) Batteries BA-403/U and BA-418/ are the most convenient power sources for use in bench tests of the receiver. If the batteries are available, install and connect them as described in TM 11-5825-203-10.

(2) If the batteries specified above are not available, use Power Supply PP-1481/PRR for the bench-test procedures. If not already installed, install the supply in the

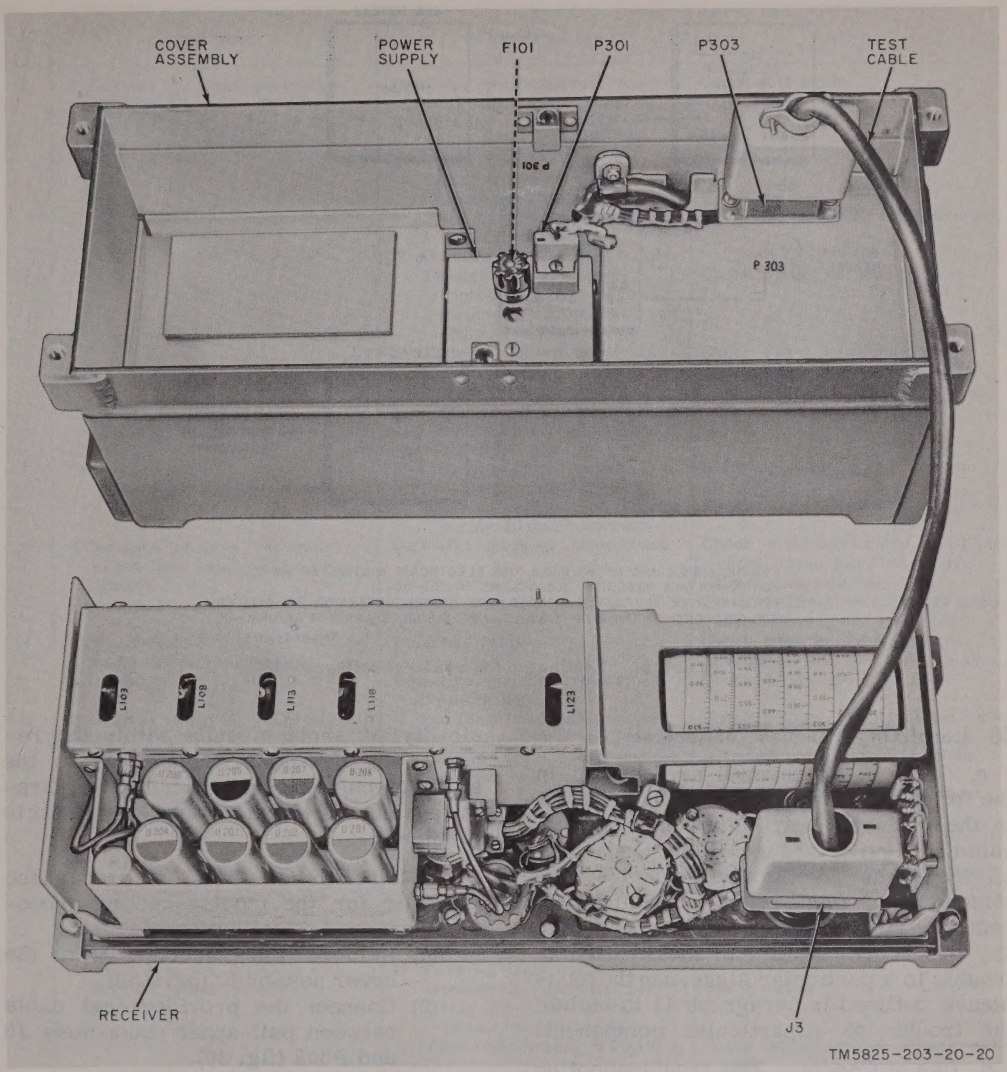
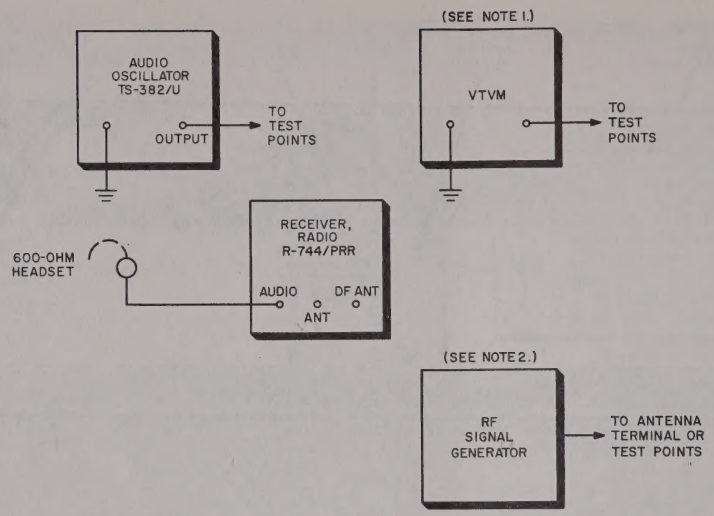


Figure 20. Receiver setup for troubleshooting.

receiver cover assembly as described in paragraph 51*b*. A source voltage of 24 volts dc at 150 milliamperes is required for operation of the power supply.

(3) If the power sources designated in (1) and (2) above are not available, use an equivalent power source capable of supplying 1.5 volts at 500 milliamperes and 45 volts at 17.5 milliamperes.

b. Test Equipment Connections. Test equipment connections vary from test to test. Figure 21 shows the general test setup required for troubleshooting.



NOTES:

1. FOR RESISTANCE AND DC VOLTAGES, USE ELECTRONIC MULTIMETER ME-26A/U. FOR AC VOLTAGE READINGS, USE VOLTMETER ME-30/U.
2. FOR AMPLITUDE MODULATED SIGNALS, USE SIGNAL GENERATOR TS-497/URR. FOR FREQUENCY MODULATED SIGNALS, USE SIGNAL GENERATOR AN/URM-48.

TM5825-203-20-21

Figure 21. Test setup for troubleshooting.

38. Localizing Troubles in Receiver

a. General. Procedures are outlined in the following charts for localizing troubles in the receiver. Part locations are indicated in figures 22 through 25. Depending on the nature of the operational symptoms, one or more of the localizing procedures will be necessary. When use of the procedure results in localization of trouble to a particular stage, use the techniques outlined in paragraph 41 to isolate the trouble to a particular component.

b. Use of Charts. The troubleshooting charts are designed to supplement the operational checks detailed in the equipment performance checklist (para 33*b*). If no operational symptoms are known, begin with item 1 of the operator's checklist (TM 11-5825-203-10) and proceed until the trouble is located.

Caution: If operational symptoms are not known, or if they indicate the possibility of short circuits within the receiver or the power supply, make the short-circuit checks described in paragraphs 36 and 44 before applying power to the units.

c. Conditions for Tests. To prepare the reciever for the troubleshooting procedure, proceed as follows:

(1) Remove the receiver from the cover assembly (para 50).
(2) Connect the provided test cable between pull-apart connectors J3 and P303 (fig. 20).
(3) Connect the test procedure power source (para 37).
(4) Turn the POWER switch to the BATT or VEH position, as appropriate, to energize the receiver.

d. Receiver Troubleshooting Chart. Perform the operations in the equipment performance checklist (para 33*b*) before using this chart, unless trouble has already been localized.

Item	Indication	Probable trouble	Procedure
1	Filaments (rf tuner assembly) and dial lamp do not light when LITE DIM control is turned to maximum clockwise position.	Defective or improperly connected test cable.	Check test cable.
		If operating from batteries:	
		Improperly connected Battery BA-403/U or defective battery cable.	Check cable.
		Defective Battery BA-403/U.	Check battery.
		Short circuit in receiver filament circuits.	Check for short circuit (para 36).
		If operating from power supply:	
		Defective or improperly connected wiring harness to power supply (P301 and J301) (fig. 20).	Check wiring harness.
		Improper power supply input voltage.	Check power input connections and power source (para 37).
		Defective power switch segment Z or associated input filter circuit components L1, C1, or C2.	Check 24-volt input circuit (fig. 34 and 26).
		Defective power supply.	Refer to power supply troubleshooting chart.
		Short in receiver or power supply filament circuits.	Check for short (para 36 and 44).
2	Filaments (rf tuner assembly) do not light (dial LITE lighted).	Defective cable or connections.	Check cable terminated in P4 and check connector J103 on rf tuner assembly (fig. 22).
		Defective (broken) wiring.	Check filament wiring in rf tuner assembly.
3	Dial LITE does not light. (Filaments (rf tuner assembly) lighted.)	Defective lamp.	Check lamp by substitution. (Refer to TM 11-5825-203-10.)
		Defective variable resistor R5 or switch S4.	Check R5 and S4 (fig. 23).
4	Indication is not A GOOD when METER switch is in 1.5V position.	If operating from batteries, Battery BA-403/U is defective.	Check battery output voltage under load.
		If operating from power supply, power supply is defective.	Refer to power supply troubleshooting chart.
		Partial short in receiver filament circuit or power supply.	Check for low-resistance short (para 36 and 44).
		If excessive filament voltage (vehicular operation), filament circuit is insufficiently loaded or power supply is defective.	Check to see that all visible filaments light.
			Check OPERATE switch (section B, segment X) and loading resistors R8 and R9 (fig. 23).
			Refer to item 3 of power supply troubleshooting chart.
5	Indication is not B GOOD with METER switch in 45V position.	If operating from battery:	
		Improperly connected Battery BA-418/U or defective battery cable.	Check cable.
		Defective Battery BA-418/U.	Check battery output voltage under load.
		If operating from power supply:	
		Defective power supply.	Refer to item 1 (para 46*d*).
		Short in receiver B+ circuits or power supply.	Check for short (para 36 and 45).
6	No meter deflection at any frequency. (METER switch in SIG position and RF GAIN and AF GAIN controls each in maximum clockwise position.)	Defective U202, U203, or U204 (fig. 2).	Check U202, U203, and U204 by substitution (para 34).
		Defective (SIG position) METER switch or associated wiring.	Check switch S3 (fig. 23).
7	Slight, constant meter deflection; no increased deflection at 2-mc calibration points throughout entire frequency range.	Defective or improperly connected cable W101 or W102 (fig. 22).	Check cables.
		Defective U206 (fig. 2)	Check U206 by substitution (para 34).

Item	Indication	Probable trouble	Procedure
		Defective OPERATE switch (section B, segment W) or associated wiring.	Check switch S5 (fig. 23).
		Defective harmonic generator.	Check diode CR101 and associated circuit (fig. 25).
		Defective V101, V102, V103, V104, V105, or V106 (fig. 2)	Test tubes (para 35). Localize defective stage by signal substitution (para 39).
		Defective U201, U202, U203, or U204 (fig. 2).	Check units by substitution (para 34). Localize defective stage by signal substitution (para 39).
8	Meter deflection occurs at the calibration points at one end of the band but not at the other end of the band.	Defective V105 or V106.	Check tubes V105 and V106 (para 35). Make careful voltage and resistance checks of the local oscillator stage (fig. 26).
9	No tone heard in headset at calibration points. No hissing heard between calibration points.	Defective headset, cable, or connector.	Check headset and associated cable.
		Defective power amplifier U208.	Check U208 by substitution (para 34).
		Defective AF GAIN control R1.	Check AF GAIN control R1 (fig. 23).
		Defective OPERATE switch (section A, segment Z) or associated wiring.	Check switch S2 and associated wiring (fig. 23). Check audio circuits by signal substitution (para 39).
10	No tone heard at calibration points. Meter deflects at calibration points. Hissing heard in headset.	Defective beat frequency oscillator U207.	Check U207 by substitution (para 34).
		Defective am. detector CR501.	Check U204 by substitution (para 34).
		Defective switch S2 (section A, segment Y or Z) or associated wiring.	Check switch S2 and associated wiring (fig. 23).
11	No meter deflection or audio tone when am. signal is injected at ANT receptacle. (Antenna selector switch in ANT position and OPERATE switch in AM position.)	Defective antenna input cable or connectors P2 and J102 (fig. 22).	Check P2, J102, and antenna cable.
		Defective antenna selector switch or associated wiring.	Check antenna selector switch S1 (fig. 23).
12	Output signal weak and distorted with 5-microvolt, amplitude-modulated rf signal injected at ANT receptacle J1 and with receiver properly adjusted.	Defective stage.	Localize defective stage, by stage-gain measurement procedure (para 40).
13	No meter deflection or audio tone with an amplitude-modulated rf signal injected at DF ANT receptacle J2 and with receiver properly adjusted. (Antenna selector switch in DF ANT position and OPERATE switch in AM position.)	Defective antenna selector switch or associated wiring.	Check antenna selector switch S1 (fig. 23).
14	No tone heard in headset with frequency-modulated rf signal injected at ANT receptacle J1 and with receiver properly adjusted. (Antenna selector switch in ANT position and OPERATE switch in FM position.)	FM detector U205 is defective (fig. 2).	Check U205 by substitution (para 34).

39. Signal Substitution

a. General. Signal substitution procedures are used to isolate defective stages of the receiver. An externally generated signal is substituted for the signal normally present at the input to each stage. Normal

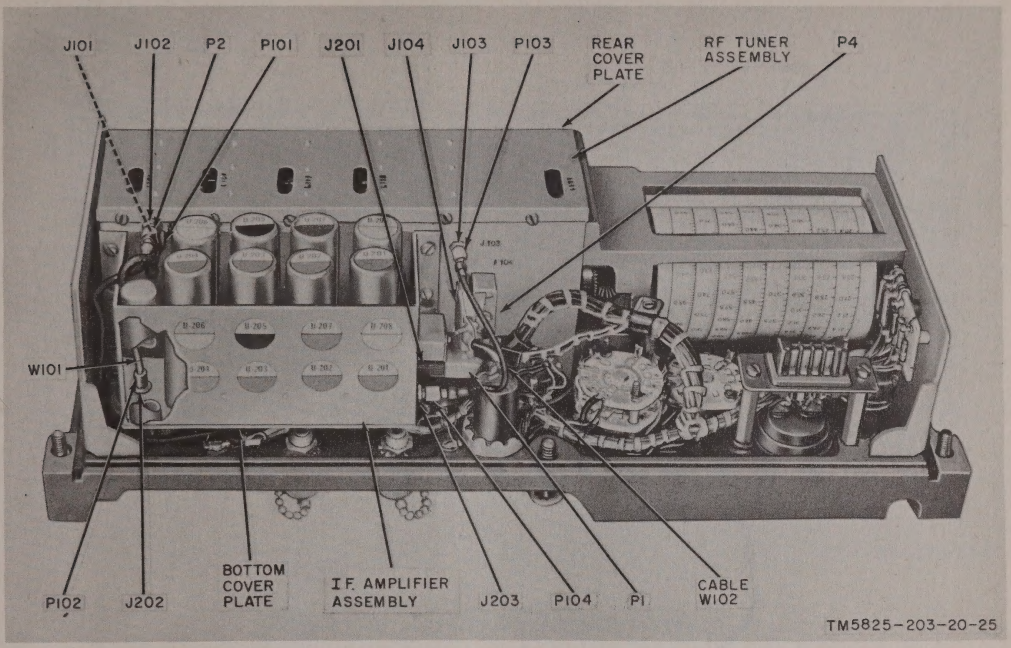


Figure 22. Receiver, Radio R–744/PRR cover assembly removed.

operation of the stage is indicated if the proper output signal is developed. Test equipment required for the tests in c through e below is listed in paragraph 31. In the following tests, ground one side of the signal generator or audio oscillator to the receiver chassis and connect the other side to the receiver test point indicated.

b. Receiver Preparation. To perform the signal substitution procedures, partial disassembly of the receiver is required. Do not attempt disassembly without reference to the instructions contained in the specified paragraphs.

(1) Remove the combined rf tuner and the amplifier assemblies (para 53*a*) and expose the pluck-out sockets.
(2) Remove 12 screws from the top cover plate of the rf tuner assembly and remove the top cover plate.
(3) Connect the test cable between J3 and P303 (fig. 20).
(4) Check to determine that connectors P4 and J104, P1 and J201, P2 and J102, and cable W102 are properly connected (fig. 22).
(5) Connect the test setup power source (para 37).
(6) Turn the POWER switch to the BATT or VEH position, as applicable.

c. Audiofrequency Tests. Start tests at the output of the power amplifier stage and work toward the detector stages. Use Audio Oscillator TS-382/U as the signal source.

(1) Set the audio oscillator to produce an audio signal of 1,000 cycles at 500 millivolts.
(2) Plug the headset into AUDIO jack J5.
(3) Apply the audio signal to pin 1 (output) of power amplifier U208. Listen for the signal in the headset. If no signal is heard, check connectors J201 and P1 (fig. 22), and the headset cord and connectors. Remove U208 (fig. 2). If the signal is obtained when U208 is removed, U208 is shorted.

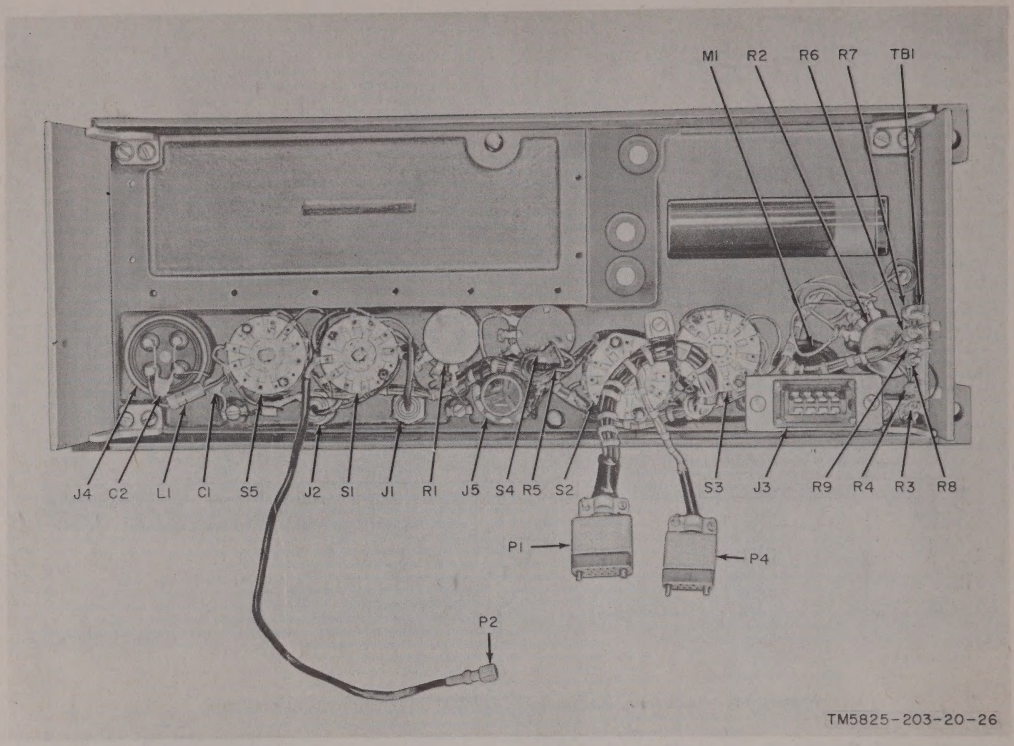


Figure 23. Front–panel assembly, rear view.

(4) Turn the AF GAIN control to the extreme clockwise position. Apply the audio signal to pin 7 (grid) of U208. Reduce the signal amplitude to 50 millivolts. Approximately the same signal level should be heard in the headset as indicated in *c*(3) above. If a substantial decrease is noted, check U208 and the associated external components.

(5) Apply the audio signal to pin 7 (output) of fm detector U205. Turn the OPERATE switch to the FM position. The same signal level should be heard in the headset as indicated in *c*(4) above. If the signal level is substantially decreased, check OPERATE switch S2 (section A, segment Z). Turn the AF GAIN control counterclockwise; the signal level should decrease. If the signal level does not decrease, check potentiometer R1.

(6) Apply the audio signal through a 0.05 microfarad (uf) capacitor to pin 5 (output) of fourth if. amplifier U204. Turn the OPERATE switch to the AM position. Turn the AF GAIN control to the extreme clockwise position. The same signal level should be heard in the headset. If the signal is not heard, check OPERATE switch S2 (section A, segment Z).

d. Intermediate-Frequency Tests. Start the tests at the output of the last (fourth) if. stage and work toward the first if. stage. Use Signal Generator TS-497/URR as the signal source.

(1) Set the am. signal generator for an amplitude-modulated signal output of 4.3 mc.

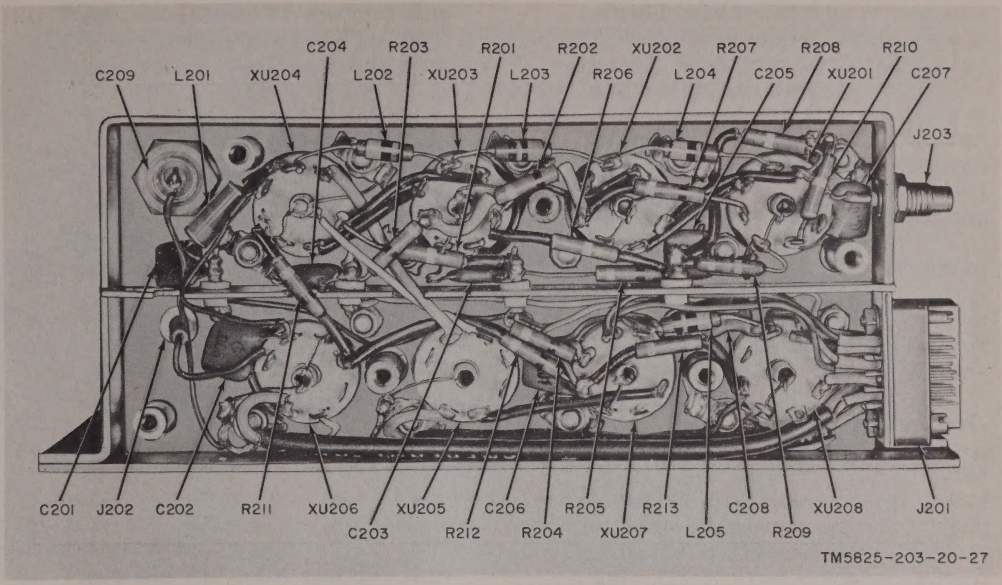


Figure 24. Amplifier assembly, parts location.

(2) Connect the headset to AUDIO jack J5.

(3) Turn the AF GAIN and RF GAIN controls to the extreme clockwise positions.

(4) Turn the OPERATE switch to the AM position.

(5) Apply the rf signal to pin 7 (plate circuit) of fourth if. amplifier U204. Adjust the amplitude of the input signal until the tone is barely audible. If no tone is heard, replace U204 (para 34). Check the associated external circuit components.

(6) Place the signal on pin 2 (grid) of fourth if. amplifier U204. If no signal amplitude increase is noted, replace U204 and check the associated external components. Adjust the amplitude of the input signal until the tone is barely audible.

(7) Apply the signal to pin 2 (grid) of third if. amplifier U203. The signal level should increase. If the signal level does not increase, replace U203. Check the external circuit components. Adjust the amplitude of the input signal until the tone is barely audible.

(8) Apply the signal to the grid (pin 2) of second if. amplifier stage U202. The amplitude of the signal should increase. If no amplitude increase is noted, replace U202 and check the external circuit components. Adjust the amplitude of the input signal until the tone is barely audible.

(9) Apply the signal to pin 2 (grid) of first if. amplifier stage U201. If the signal amplitude does not increase, or if no signal is heard, replace U201. Check external circuit components.

(10) Place the OPERATE switch in the FM position. Apply a 4.3-mc am. signal to pin 2 (grid) of first if. amplifier stage U201. No tone should be heard in the headphone. Vary the frequency approximately 15 kilocycles above and below the if. frequency. A tone should be

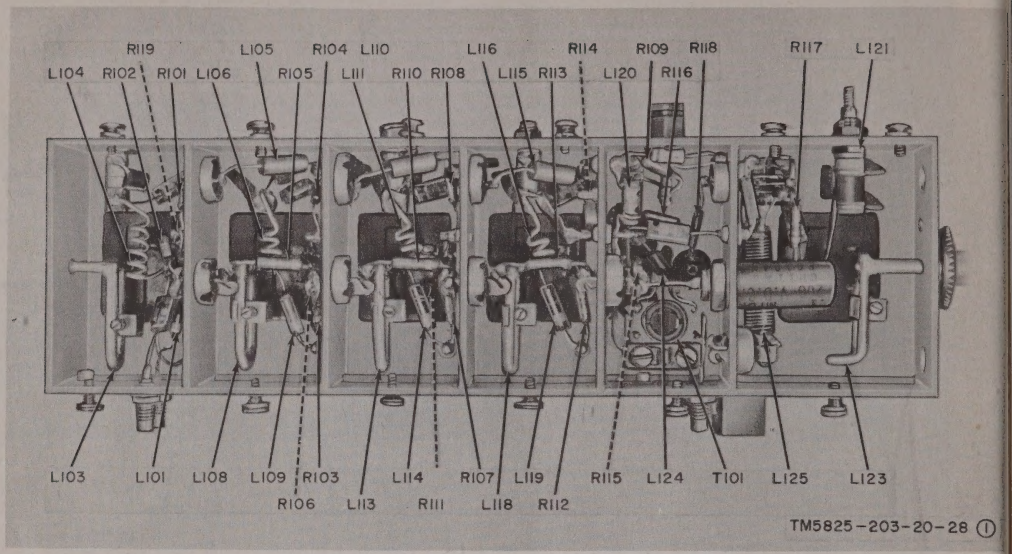


Figure 25 (1). Rf tuner frame assembly, location of components (part 1 of 2).

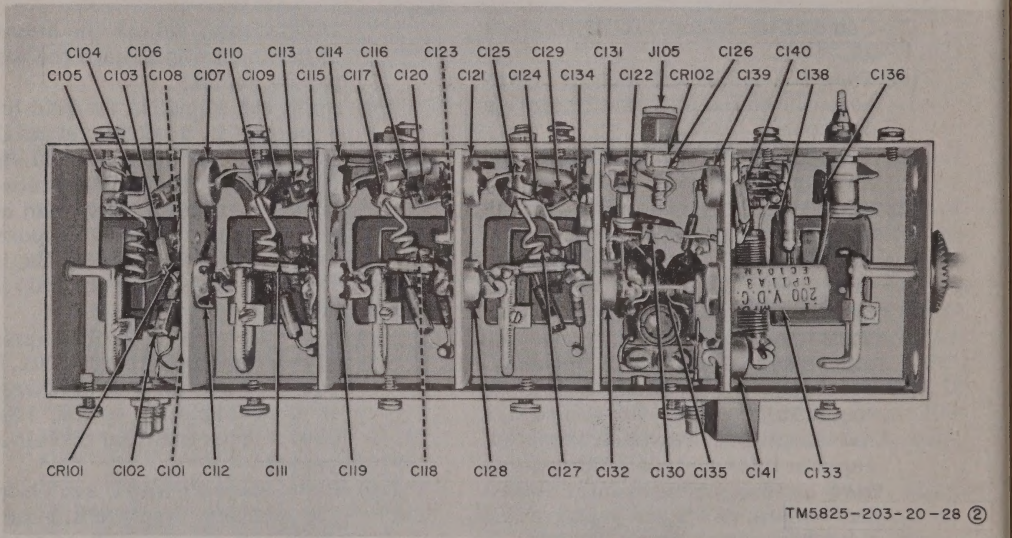


Figure 25 (2). Rf tuner frame assembly, location of components (part 2 of 2).

heard that increases in amplitude as the frequency deviation is increased. If no tone is produced, replace fm discriminator U205 and check the associated external circuit components.

(11) Place the OPERATE switch in the CW position. Apply a 4.3-mc continuous wave signal to pin 2 (grid) of first if. amplifier stage U201. A tone should be heard in the headphones. If no tone is heard, detune the cw signal slightly (few-hundred cycles per second). If no tone is produced, replace beat frequency oscillator U207. Check the associated external circuit components.

e. Radiofrequency Tests. Start the radiofrequency tests at the mixer stage and work toward the antenna circuit. Use Signal Generator TS-497/URR as the signal source.

(1) Set the am. signal generator for an amplitude-modulated output of 4.3 mc.
(2) Turn the OPERATE switch to the AM position.
(3) Place the AF GAIN and RF GAIN controls in the extreme clockwise position.
(4) Connect the headset to AUDIO jack J5.
(5) Apply the signal to the center conductor of connector J103 (fig. 22). A tone should be heard in the headset. If the tone is not heard, check cable W102 and connectors P103, J103, P104, and J203.
(6) Apply the signal to pin 4 (grid) of mixer V104. The tone should be heard with slightly increased amplitude. If the tone is not heard, check tube V104 and associated components.
(7) Adjust the signal generator to produce an amplitude-modulated signal within the frequency range of the receiver. Tune the receiver to the same frequency.
(8) Place the signal on pin 4 (grid) of mixer V104. A tone should be heard in the headphones. Adjust the signal amplitude until the tone is barely audible. If no tone is heard, check the tubes and components of the local oscillator stage.
(9) Apply the signal to the grid (pin 4) of third rf amplifier V103. The tone should be heard with increased amplitude. If no amplitude increase is noted, check tube V103 and the associated components.
(10) Apply the signal to the grid (pin 4) of second rf amplifier V102. The tone should be heard with increased amplitude. If the signal level does not increase, check tube V102 and the associated components.
(11) Apply the signal to the grid (pin 4) of first rf amplifier V101. If no increase of signal level is noted, or if the signal is not heard, check tube V101 and the associated components.
(12) Apply the signal to the center conductor of ANT receptacle J1. Place the antenna selector switch in the ANT position. If the signal is not heard, check connectors P2 and J102 and the associated cable (fig. 22). Check the antenna circuit. Check the antenna selector switch and the associated wiring.
(13) Supply the signal to the center conductor of DF ANT receptacle J2. Place the antenna selector switch in the DF ANT position. If the signal is not heard, check the antenna selector switch and the associated wiring.

f. Reassembly of Receiver. Upon completion of the signal substitution procedures, reassemble the receiver as follows:

(1) Turn the POWER switch to OFF.
(2) Disconnect the test power source.
(3) Remove the test cable from J3 and P303 (fig. 20).
(4) Mount the top cover plate on the rf tuner assembly and replace the 12 screws.
(5) Replace the combined rf tuner and amplifier assemblies (para 53*b*).

40. Stage–Gain Measurements

Use the stage-gain measurement procedure outlined in *b* through *e* below, when the receiver output signal is abnormally low or distorted and the trouble cannot be corrected by tube or pluck-out unit substitution. When the defect is localized to

the stage that is operating at reduced gain, isolate the defect within the stage by performing voltage and resistance measurements (para 41).

a. General Instructions. Prepare the receiver for stage-gain checks as described in paragraph 39*b*. Set the FUNCTION switch of the vtvm to AC and connect the vtvm between AUDIO jack J5 and ground. Connect a 600-ohm, 0.5-watt resistor across the vtvm (between AUDIO jack J5 and ground). Turn the AF GAIN control to the extreme clockwise position. Other control settings and test equipment connections depend on the particular stages under test and are included in the explanatory information that precedes each test procedure.

b. Audio Stages. Turn the RF GAIN control to the maximum clockwise position. Turn the OPERATE switch to the AM position. Connect the audio oscillator between pin 5 of U204 and ground. Adjust the audio oscillator for a frequency of 1,000 cycles per second. Measure the input signal with the vtvm and adjust it for an amplitude of 0.06 volt. Measure the output voltage across the load resistor with the vtvm and compute the voltage gain of power amplifier U208. If the gain is within 10 percent of 8.33, the stage is operating properly. If the gain is abnormally low, use voltage and resistance measurements (para 41) to isolate the defect within the stage.

c. If. Stages. Turn the RF GAIN and AF GAIN controls to the maximum clockwise positions. Disconnect P104 from J203 (fig. 22). Connect the am. signal generator in series with a 20-micromicrofarad (uuf) capacitor to each test point indicated below. Adjust the am. signal generator to 4.3 mc, modulated 30 percent at 1,000 cps. Adjust the amplitude of the input signal to obtain 1-volt audio output across the 600-ohm load. If the gain of a particular stage is abnormally low, replace the pluck-out stage, and use voltage and resistance measurements (para 41) to check the associated external circuit components.

Test connection	Input voltage (microvolts)	Output voltage (volts)	Gain
Pin 2 of U204	43,000	1	
Pin 2 of U203	2,400	1	18
Pin 2 of U202	150	1	16
Pin 2 of U201	13	1	11
J203	13	1	1

d. Fm Detector. Turn the OPERATE switch to FM and check to see that the RF GAIN and AF GAIN controls are set at maximum. Connect the vacuum-tube voltmeter to pin 7 of U205 or to the high side of AF GAIN control R1. Apply a 4.3-mc cw signal to J203, and adjust the am. signal generator output to produce one-division deflection on meter M1. At 4.3 mc, the vtvm should indicate 0 volt. As the generator frequency is shifted 30 kilocycles (kc) each side of the center frequency, an output voltage greater than 3 volts dc indicates normal fm detector sensitivity.

e. Rf and Mixer Stages. Connect P104 to J203 and set the RF GAIN control to its midposition. Tune the receiver to 60 megacycles. Connect the am. signal generator in series with a 20-uuf capacitor to the test points indicated below and adjust the amplitude of 4.3-mc am. input signal to obtain 1-volt audio output across the 600-ohm load. Adjust the output frequency of the signal generator to 60 megacycles. If the gain of a particular stage is abnormally low, check the tubes and perform voltage and resistance measurements (para 41) to determine which component is defective in the stage.

NC

0V
32

0V
2.8MEG
(NOTE 12)

0V
120K

0V
0

-2.2V
120K

0V
0

1.31V
*1

0V
470K

the stage that is operating at reduced gain, isolate the defect within the stage by performing voltage and resistance measurements (para 41).

a. General Instructions. Prepare the receiver for stage-gain checks as described in paragraph 39*b*. Set the FUNCTION switch of the vtvm to AC and connect the vtvm between AUDIO jack J5 and ground. Connect a 600-ohm, 0.5-watt resistor across the vtvm (between AUDIO jack J5 and ground). Turn the AF GAIN control to the extreme clockwise position. Other control settings and test equipment connections depend on the particular stages under test and are included in the explanatory information that precedes each test procedure.

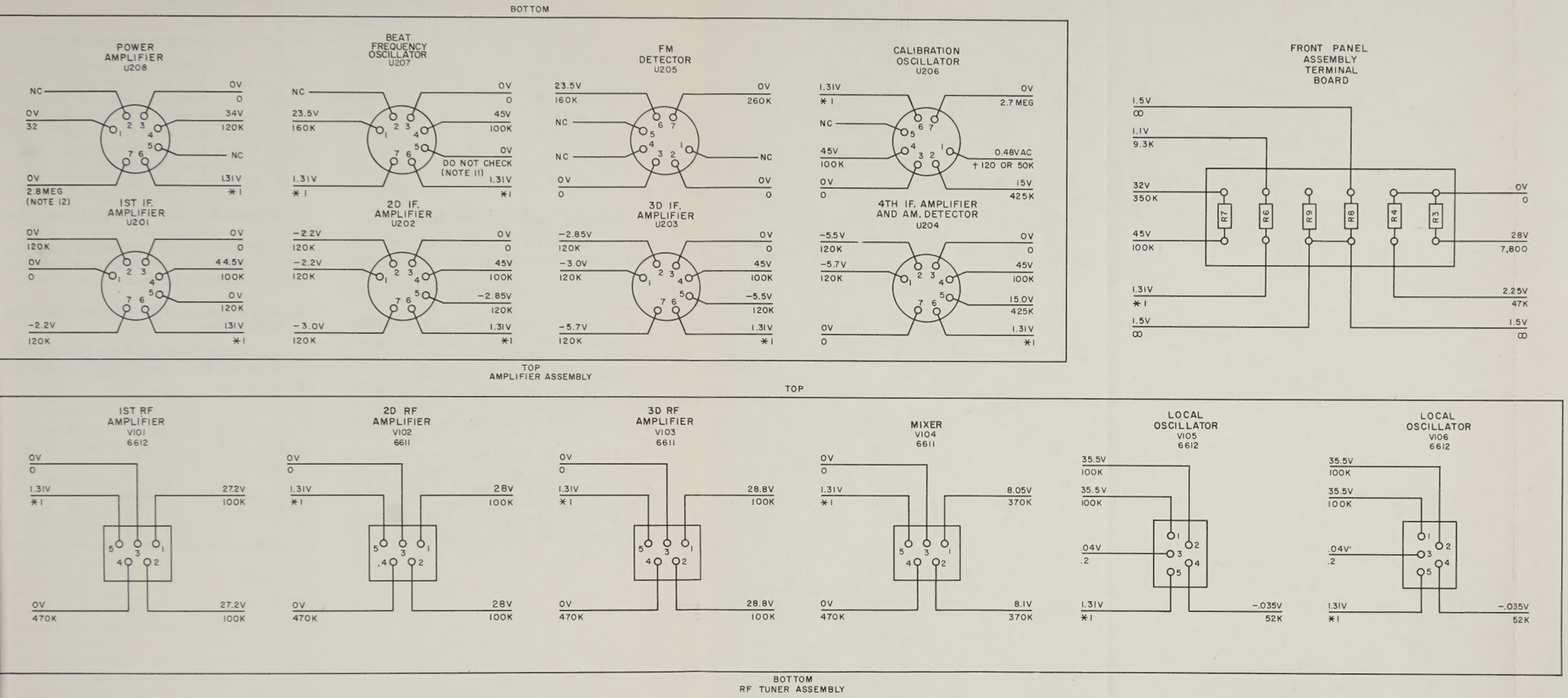
b. Audio Stages. Turn the RF GAIN control to the maximum clockwise position. Turn the OPERATE switch to the AM position. Connect the audio oscillator between pin 5 of U204 and ground. Adjust the audio oscillator for a frequency of 1,000 cycles per second. Measure the input signal with the vtvm and adjust it for an amplitude of 0.06 volt. Measure the output voltage across the load resistor with the vtvm and compute the voltage gain of power amplifier U208. If the gain is within 10 percent of 8.33, the stage is operating properly. If the gain is abnormally low, use voltage and resistance measurements (para 41) to isolate the defect within the stage.

c. If. Stages. Turn the RF GAIN and AF GAIN controls to the maximum clockwise positions. Disconnect P104 from J203 (fig. 22). Connect the am. signal generator in series with a 20-micromicrofarad (uuf) capacitor to each test point indicated below. Adjust the am. signal generator to 4.3 mc, modulated 30 percent at 1,000 cps. Adjust the amplitude of the input signal to obtain 1-volt audio output across the 600-ohm load. If the gain of a particular stage is abnormally low, replace the pluck-out stage, and use voltage and resistance measurements (para 41) to check the associated external circuit components.

Test connection	Input voltage (microvolts)	Output voltage (volts)	Gain
Pin 2 of U204	43,000	1	
Pin 2 of U203	2,400	1	18
Pin 2 of U202	150	1	16
Pin 2 of U201	13	1	11
J203	13	1	1

d. Fm Detector. Turn the OPERATE switch to FM and check to see that the RF GAIN and AF GAIN controls are set at maximum. Connect the vacuum-tube voltmeter to pin 7 of U205 or to the high side of AF GAIN control R1. Apply a 4.3-mc cw signal to J203, and adjust the am. signal generator output to produce one-division deflection on meter M1. At 4.3 mc, the vtvm should indicate 0 volt. As the generator frequency is shifted 30 kilocycles (kc) each side of the center frequency, an output voltage greater than 3 volts dc indicates normal fm detector sensitivity.

e. Rf and Mixer Stages. Connect P104 to J203 and set the RF GAIN control to its midposition. Tune the receiver to 60 megacycles. Connect the am. signal generator in series with a 20-uuf capacitor to the test points indicated below and adjust the amplitude of 4.3-mc am. input signal to obtain 1-volt audio output across the 600-ohm load. Adjust the output frequency of the signal generator to 60 megacycles. If the gain of a particular stage is abnormally low, check the tubes and perform voltage and resistance measurements (para 41) to determine which component is defective in the stage.



NOTES:

1. INPUT VOLTAGES FROM "A" AND "B" BATTERIES.
2. BATTERIES DISCONNECTED AND REMOVED FOR RESISTANCE MEASUREMENTS.
3. RF GAIN AND AF GAIN CONTROLS IN MAXIMUM CLOCKWISE POSITION.
4. POWER SWITCH IN BATT POSITION.
5. OPERATE SWITCH IN CAL POSITON.
6. LITE DIM CONTROL IN MAXIMUM CLOCKWISE POSITION.
7. * USE OHMMETER RX10 RANGE TO PREVENT DAMAGE TO FILAMENTS.
8. † VALUE DEPENDS UPON OHMMETER POLARITY.
9. VOLTAGES AND RESISTANCES MEASURED TO GROUND.
10. VOLTAGES MEASURED WITH VOLTMETER ME-26A/U OR EQUIVALENT.
11. MEASURING WITH AN OHMMETER MAY DAMAGE THE PANEL METER.
12. RESISTANCE DEPENDS UPON SETTING OF R1.

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Figure 26. Receiver, Radio R-744/PRR, voltage and resistance diagram.

Test connection	Input voltage (microvolts)	Output voltage (volts)	Gain
Pin 1 of V104	62 (at 4.3 mc)	1	
Pin 4 of V104	37 (at 60 mc)	1	1.7
Pin 4 of V103	9.2 (at 60 mc)	1	3.9
Pin 4 of V102	6.4 (at 60 mc)	1	1.5
Pin 4 of V101	2.3 (at 60 mc)	1	2.8
J102	1.1 (at 60 mc)	1	2.1
J1	0.9 (at 60 mc)	1	1.2

41. Isolating Troubles Within Stage

When the trouble has been localized to a stage, either through operational checks or signal substitution (para 39), use the following procedures to isolate the defective component.

a. Test the suspected tube or substitute a known good tube (para 35). If the stage is sealed in a pluck-out unit, test the pluck-out unit by substitution (para 34).

b. Make voltage measurements at the tube or pluck-out unit socket and at other points related to the suspected stage (fig. 26).

c. If voltage readings are abnormal, make resistance measurements (fig. 26). The dc resistance values of transformers and coils are given in paragraph 42.

d. If signals are weak and all checks fail to indicate a defective component, check the alignment of the receiver (para 58 and 59).

e. Use the complete schematic diagrams (fig. 17 and 34) to circuit-trace and analyze the source of trouble.

42. Dc Resistance of Transformers and Coils in Receiver

The dc resistances of the transformer windings and the coils in the receiver are listed below.

Transformer	Terminals	Ohms
T101	1-2	1.55
	3-4	Less than 0.1
L125	1-2	0.2
	3-4	0.2

43. Troubleshooting Transistor Circuits

Transistors are sensitive to bias voltages, momentary short circuits, improperly applied voltages, and excessive currents. Special precautions must be observed when troubleshooting such circuits. Before troubleshooting the power supply, read and become familiar with the instructions contained in this paragraph. Transistors can be ruined by improper or careless handling.

a. In some test equipment, the ac input is bypassed to the chassis by capacitors. This places an ac voltage on the chassis which can pass through the unit under test and cause damage to the transistors. To eliminate this hazard, a common ground lead must be connected between the common return of the circuit under test and the test equipment before making any test probe connections.

b. Use a 20,000-ohm-per-volt meter or a vacuum-tube voltmeter when making voltage tests on the power supply. Meters that have lower sensitivities may draw excessive currents from the circuits under test when used on their low-voltage ranges. Do not use a meter that has a sensitivity lower than 5,000-ohms per volt on the lowest range. When a vacuum-tube voltmeter is used, observe the precautions given in *a* above.

c. When making resistance checks, do not permit excessive current to flow through the circuit under test. Current in excess of a few milliamperes may damage the junction-type transistors contained in the power supply. Before using any ohmmeter to measure resistance in a transistor circuit, check the current that flows through the external circuit on all ranges of the ohmmeter. The current may be checked by connecting a low internal resistance milliammeter in series with the test leads and observing the current for each of the ohmmeter ranges. It is recommended that the transistors be removed before making resistance measurements in the associated circuits.

d. When troubleshooting procedures indicate that one of the transistor stages is faulty, perform voltage and resistance measurements to locate the malfunctioning component. Always observe the precautions outlined above when performing such measurements.

e. To remove a transistor from the power supply, unscrew the two self threading screws that secure the transistor to the power supply, and then pull the transistor out of its socket. Do not rock the transistor in its socket when removing it. Be careful to retain the transistor mounting plate.

Caution: **Never remove or replace a transistor while power is applied to the power supply. Surge currents may damage the transistor.**

f. A transistor should not be replaced in a circuit until it has definitely been established that no short circuits exist in the power supply. A short circuit may affect the bias voltage on the transistor, and thus damge the replacement transistor.

44. Checking Power Supply Filament and B+ Circuits for Shorts (fig. 17)

a. When to Check. When any of the following conditions apply, check for short circuits and clear the troubles before applying power.

(1) When the power supply is being serviced apart from the other units of Receiver Group OA-1451/PRR, and when the nature of the abnormal symptoms are not known.

(2) When abnormal symptoms reported from operational tests indicate possible power supply troubles (items 4 and 5 of the equipment performance checklist (para 33*b*)).

b. Conditions for Tests. To prepare for the short-circuit tests, perform the procedures below:

(1) If the power supply is mounted inside the receiver, remove the receiver cover assembly (para 50).

(2) Remove the power supply from the receiver (para 51).

c. Measurements. Make the resistance measurements indicated in the chart below. If abnormal results are obtained, make the additional isolating checks outlined. When the faulty part is found, repair the trouble before applying power to the unit.

Caution: Ohmmeter voltages of wrong polarity can destory transistors if the test leads are inadvertently touched to the wrong test points.

Power supply, short-circuit test

Point of measurement	Normal indication	Isolating procedure
Between terminal E of connector J301 (fig. 27) and chassis ground.	Approximately 100 ohms.[a]	If reading is 10% higher than 100 ohms, check for open R303, and CR302 through CR305 (fig. 29). If reading is 10% lower than 100 ohms, check for short in C304 (fig. 29).
Between terminal F of connector J301 (fig. 27) and chassis ground.	3 ohms.[a]	If more than 4 ohms, check for open in VR304 or VR303 (fig. 28) If less than 2 ohms, check for short in VR303, VR304, C305, C306, CR306, CR307, or L302 (fig. 28 and 29).

[a]Depends on ohmmeter polarity. Value given is the smaller reading.

45. Power Supply Test Setup

To prepare the power supply for troubleshooting, perform the procedures below.

a. If the power supply is mounted in the receiver, remove the receiver from the cover assembly (para 50).

b. Detach the power supply and open the power supply case (para 51).

c. Place the power supply in such a position that plug P301 in the cover assembly mates with socket J301 in the power supply (fig. 27). Be sure that no exposed power supply components contact the receiver case and dust cover assembly or the front panel assembly.

d. Connect the provided test cable between receiver connectors J3 and P303 (fig. 20).

e. Connect a 24-volt source (150 milliamperes) to VEH POWER jack J4 on the receiver front panel. Terminal A or B (fig. 17) is positive and terminal C or D (fig. 17) is negative.

f. Place the receiver POWER switch in the VEH position.

Note. The test setup described in *a* and *b* above is preferred. If the receiver is not available for test procedures, proceed to *g* through *i* below.

g. Connect a 3-ohm, 2-watt resistor between C and H of J301 (fig. 17 and 27). Connect a 2,700-ohm, 2-watt resistor from E of J301 to ground.

h. Connect the positive lead from the 24-volt dc source to B of J301.

i. Connect the negative lead from the source voltage to chassis ground.

Caution: Do not ground or mistake for ground the metal bases of transistors Q302 and Q303 (fig. 28). These surfaces operate at ac and dc voltages which are above ground potential.

46. Localizing Troubles in Power Supply

a. General. The procedures are outlined in *d* below for localizing troubles in the power supply to specific parts. Parts location is indicated in figures 28 and 29. Depending on the nature of the operational symptoms, one or more of the localizing procedures will be necessary.

b. Use of Troubleshooting Chart. The troubleshooting chart is designed to supplement the operational checks pertinent to the power supply, as detailed in the equipment performance checklist (para

33*b*). If no operational symptoms are known, begin with item 1 of the equipment performance checklist and proceed until the trouble is located.

c. Conditions for Tests. All checks are to be conducted with the power supply set up as described in paragraph 45.

d. Power Supply Troubleshooting Chart.

Note. Perform the operations in the equipment performance checklist (para 33) before using this chart, unless trouble has already been localized.

Item	Indication	Probable trouble	Procedure
1	Low or no plate voltage. Filament supply voltage is normal.	Short circuit in plate supply circuit of power supply.	Check power supply B+ circuit for short (para 44).
		Short circuit in receiver B+ circuit (if receiver is overloading B+ circuit).	Check receiver B+ circuit for short (para 36).
		Defective plate supply circuit.	Check diodes CR302 through CR 305 (fig. 29).
			Check R303 (fig. 29) for open circuit.
			Check C303 and C304 (fig. 29) for short circuits.
			Check T301 secondary plate winding (fig. 28) for open or short circuit. Make voltage and resistance measurements of plate supply circuit (fig. 30).
2	Low or no filament voltage. Plate supply voltage is normal.	Short circuit in filament supply circuit of power supply.	Check power supply filament circuit for short (para 44).
		Short in filament circuit (if receiver is overloading the filament circuit).	Check receiver filament circuit for short (para 36).
		Defective filament supply circuit.	Check diodes CR306 and CR307 (para 47*b*(4)).
			Check L302 (fig. 28) for open circuit.
			Check C305 (fig. 28) and C306 (fig. 29) for short circuits.
			Check secondary filament winding of T301 (fig. 28 and 30) for open circuits.
			Make voltage and resistance measurements of filament supply circuit (fig. 29 and 30).
3	Excessive filament voltage. Plate supply voltage normal.	Defective voltage regulator VR303 or VR304.	Check VR303 and VR304.
		Low filament load	If receiver is connected to the power supply, refer to item 4 of receiver troubleshooting chart (para 38*d*).
4	Low or no power supply input voltage.	Improper connection betweeen power source and power supply, if power source is applied directly.	Check power input connections (para 37*a*).
		Defective power source	Check power source voltage at 150 milliamperes.
		If 24 volts is applied from receiver, defective vehicular input circuit.	Refer to item 1 of receiver trouble shooting chart (para 38*d*).
5	No output voltages. Input voltage to saturation oscillator is zero or considerably less than 18 volts. Normal input to power supply.	Defective input voltage regulator circuit.	Check fuse F301, L301, C301, and CR301 (fig. 28 and 29).
			Check resistor R301.
			Check transistor Q301 by substitution.
			Check Zener diodes VR301 and VR302 (fig. 29).
			Check C302 (fig. 29) for short.
			Make voltage and resistance check on input regulator circuit (fig. 30).

Item	Indication	Probable trouble	Procedure
6	No output voltages. Input voltages to saturation oscillator regulated at 18 volts.	Defective saturation oscillator circuit.	Check transistors Q302 and Q303 (fig. 28) by substitution. Check resistor R302 (fig. 29) and primary windings of T301 (fig. 28) for open or short circuits. Make voltage and resistance checks on oscillator circuits (fig. 30).

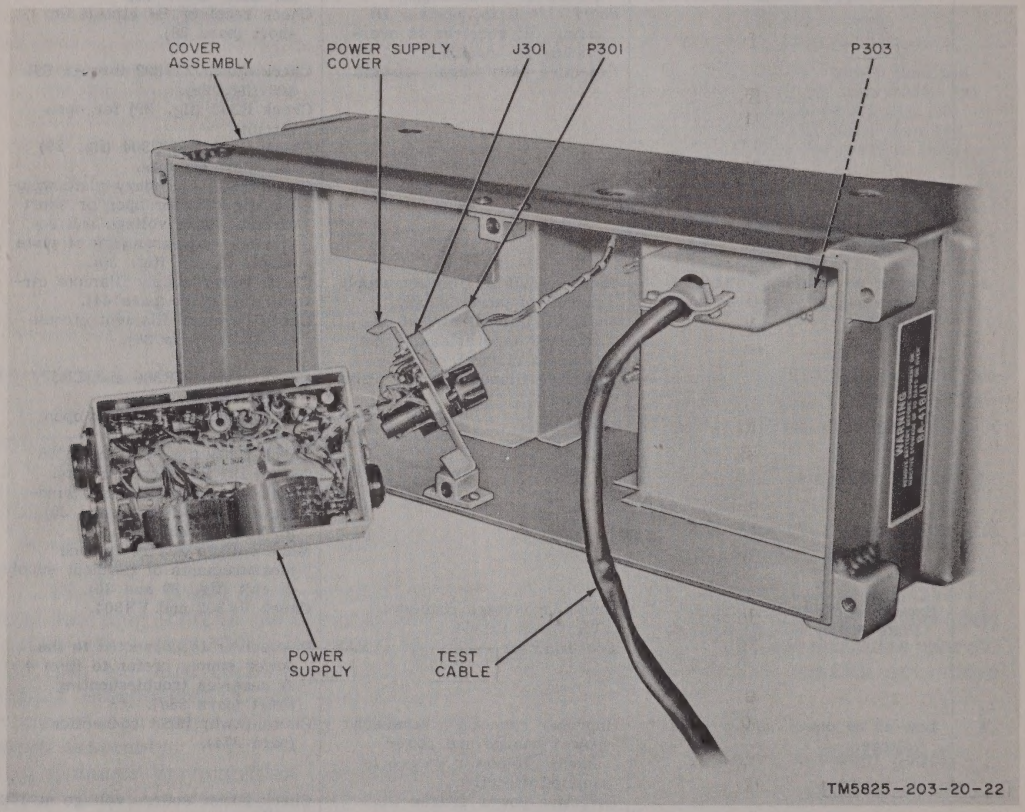


Figure 27. Power supply setup for troubleshooting.

47. Locating Troubles in Power Supply

Voltage and resistance readings are used to isolate the trouble to a specific part. The following procedure is presented as a further aid in troubleshooting the power supply. This procedure requires the use of a 20,000 ohm-per-volt meter and a low-wattage soldering iron. Reference should be made to the voltage and resistance diagram (fig. 30), the power supply parts location diagrams (fig. 28 and 29), and the power supply schematic diagram (fig. 17). The dc resistances of the transformer and coil windings in the power supply are listed in paragraph 48. To locate troubles, proceed as follows:

a. Set up the power supply and apply

power to it as described in paragraph 45.

b. Use a 20,000 ohm-per-volt meter to check for the presence of approximately 23 volts at terminal 2 of transformer T301. If the voltage is low or absent, check the voltage readings at series connected elements F301 and L301. If fuse F101 blows repeatedly and no short circuits have been detected as a result of performing the procedures in paragraph 44, proceed as follows:

(1) Remove power from the power supply.

(2) Remove voltage regulator transistor Q301 (para 43e).

(3) Measure the dc resistance between terminal 2 of T301 and ground that connects the positive ohmmeter lead to the transformer and the negative lead to ground. If a resistance reading of less than 500 ohms is obtained, replace capacitor C301. Before reapplying power, check diode CR301 and replace it if defective.

(4) To test a diode, unsolder one lead and compare the forward and back resistance measured with an ohmmeter. The forward resistance should be in the order of hundreds of ohms, while the backward resistance is many hundred times more.

Caution: **Diodes may be damaged by heat. When soldering a connection to a diode, grasp the lead between the soldering point and the diode body to dissipate the heat.**

c. If the voltage measured at terminal 2 of transformer T301 is normal, check for the presence of approximately 5 volts dc at the base of input voltage regulator transistor Q301. If this voltage is low or absent, remove power from the power supply, remove transistor Q301, apply power, and repeat the measurement. If the reading now is normal, replace transistor Q301. If the voltage reading remains abnormal with the transistor removed, remove power from the power supply, and check for the presence of approximately 800 ohms between the base connection of transistor Q301 and ground. If the resistance is abnormally high, replace resistor R301. If the resistance reading is normal, replace Zener diodes VR301 and VR302.

Note. Both diodes must be replaced with another matched pair, designated JAN type SV5009. Never replace either diode singly.

d. If the dc voltage at the base of input voltage regulator transistor Q301 is normal, measure the dc voltage between the emitter of transistor Q301 and ground. If this voltage is not approximately 5 volts, remove power and replace each of the three transistors in turn; check the emitter voltage at trasnsistor Q301 each time. If substitution of the transistors does not remedy the abnormal condition, remove power from the power supply, remove the three transistors (para 43*a*), and check the resistances of the windings of transformer T301 (para 48). If the resistance of any winding is abnormal, replace transformer T301.

e. If the dc voltage at the emitter of input voltage regulator transistor Q301 is normal, measure the ac voltage across terminals 7 and 8 of transformer T301. If the measured voltage is not approximately 50 volts ac, remove power from the power supply and measure the dc resistance of winding 7-8 of transformer T301 (para 48). If the winding is open, replace T301.

48. Dc Resistances of Transformers and Coils in Power Supply

The dc resistances of the transformer windings and coils in the power supply are listed below:

Transformer or coil	Terminals	Ohms
T301	1-2	0.1
	2-3	0.1
	4-5	Less than 0.1
	5-6	Less than 0.1
	7-8	2.2
	9-10	0.5
	10-11	0.5
L301	1-2	0.7
L302	1-2	0.2

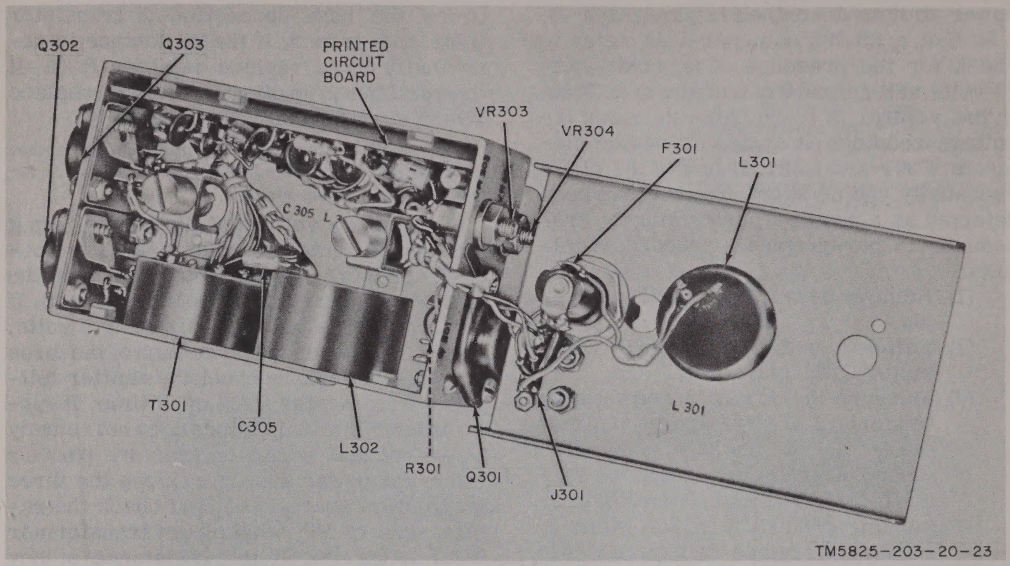
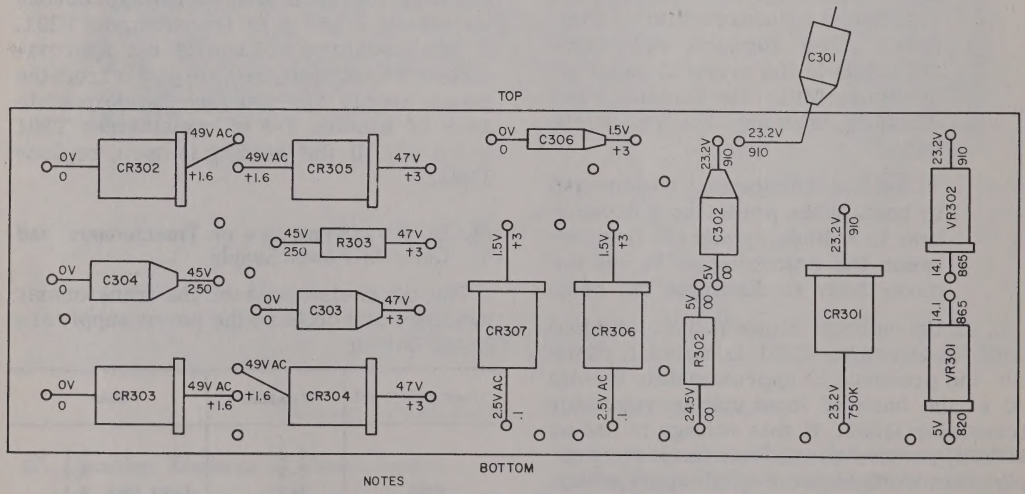


Figure 28. Power supply printed circuit board, location of components.

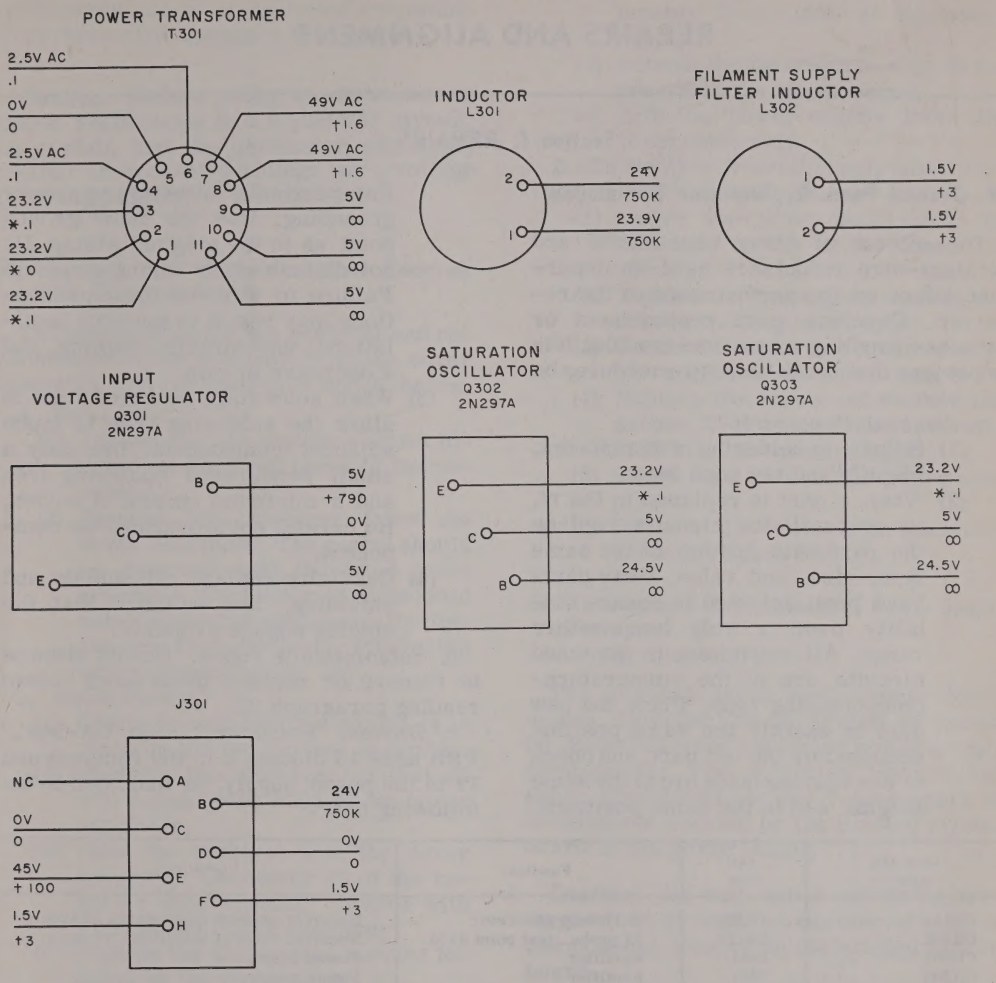


NOTES

1. VOLTAGE MEASUREMENTS INDICATED FOR POWER SUPPLY OUTPUT INTO RECEIVER LOAD. POWER SUPPLY INPUT +24V.
2. VOLTAGES MEASURED WITH 20,000 OHMS-PER-VOLT METER.
3. RESISTANCES MEASURED WITH P301 DISCONNECTED FROM POWER SUPPLY AND TRANSISTORS REMOVED.
4. VOLTAGES AND RESISTANCES MEASURED TO CHASSIS GROUND.
5. † INDICATES RESISTANCE VALUE IS DEPENDENT UPON POLARITY OF OHMMETER.

TM5825-203-20-24

Figure 29. Power supply printed circuit board, location of components.



NOTES:

1. VOLTAGE MEASUREMENTS INDICATED FOR OUTPUT INTO RECEIVER LOAD. POWER SUPPLY INPUT +24V.
2. VOLTAGES MEASURED WITH 20,000 OHMS-PER-VOLT METER.
3. RESISTANCES MEASURED WITH P301 DISCONNECTED AND TRANSISTORS REMOVED.
4. VOLTAGES AND RESISTANCES MEASURED TO CHASSIS GROUND UNLESS OTHERWISE INDICATED.
5. † INDICATES RESISTANCE VALUE IS DEPENDENT UPON POLARITY OF OHMMETER.
6. * INDICATES RESISTANCES MEASURED TO POSITIVE TERMINAL OF VR302.
7. TRANSISTOR RESISTANCES MEASURED WITH POSITIVE LEAD CONNECTED TO COLLECTOR. USE FOLLOWING RESISTANCE RANGES:

MEASUREMENT	RANGE	RESISTANCE
EMITTER TO COLLECTOR	X100	800 TO 2K
BASE TO COLLECTOR	X1000	10K TO 20K

TM5825-203-20-30

Figure 30. Power Supply PP-1481/PRR, voltage and resistance diagram.

CHAPTER 6
REPAIRS AND ALIGNMENT

Section I. REPAIRS

49. General Parts Replacement Techniques

The effects of stray capacitance and straight-wire inductance have an important effect on the performance of the receiver. Careless part replacement or careless handling may cause trouble. It is important that the following procedures be followed.

a. General Precautions.

(1) Before unsoldering a component, identify and tag each lead.

(2) When a part is replaced in the rf, if. or oscillator circuits, replace the part with another of the same type, size, and value. Many parts have been selected to ensure stability over a wide temperature range. All capacitors in the tuned circuits are of the temperature-compensating type. Place the new part in exactly the same position occupied by the old part, and check to see that the leads are of the same lengths and in the same positions. Pay particular attention to proper grounding. Use the same ground point as in the original wiring. Do not disturb other wiring or parts. Failure to observe these precautions may result in spurious oscillations, undesirable coupling, and a decrease in gain.

(3) When soldering, be careful not to allow the soldering iron to touch adjacent components. Use only a small pencil-type soldering iron and a minimum amount of solder. Be careful not to overheat the component.

(4) Carefully replace all shields and shielding, and be sure that the shields engage properly.

b. Subminiature Tubes. Do not attempt to remove or replace these tubes before reading paragraph 35.

c. Diodes. Receiver Group OA-1451/PRR uses 13 diodes, 2 in the receiver and 11 in the power supply, as indicated in the following chart:

Reference symbol	JAN type	Function	Location
CR101	1N198	Harmonic generator	Receiver antenna input stage, rf tuner.
CR102	1N128	Rf probe, test point J105	Receiver third rf amplifier, rf tuner.
CR301	IN91	Rectifier	Power supply.
CR302	IN91	Rectifier	Power supply.
CR303	IN91	Rectifier	Power supply.
CR304	IN91	Rectifier	Power supply.
CR305	IN91	Rectifier	Power supply.
CR306	IN91	Rectifier	Power supply.
CR307	IN91	Rectifier	Power supply.
VR301 (matched	SV5009	Regulator	Power supply.
VR302 pair)		Regulator	Power supply.
VR303 (matched	SV6029	Regulator	Power supply.
VR304 pair)		Regulator	Power supply.

Note. When replacing diodes, cut the leads slightly longer than required to permit the use of long-nosed pliers as a heat barrier. Never use a soldering iron larger than 25 watts size.

d. Transistors. Power transistors are used in the power supply. Before using the test equipment in transistorized circuits, be sure that no excessive voltage exists between the test equipment and the component to be tested (para 43*a*). The potential

which often exists between test sets and equipments can be of sufficient magnitude to permanently damage a transistor.

Caution: **Before using an ohmmeter to check resistances in a transistor circuit, be certain that the ohmmeter will apply neither an excessive voltage nor a voltage of wrong polarity to the transistor.**

50. Removal and Replacement of Receiver from Cover Assembly

The procedures for the removal and replacement of the receiver from the cover assembly are outlined in *a* and *b* below.

a. Removal.

(1) Loosen the six captive screws located on the front panel of the receiver.

(2) Remove the receiver from the cover assembly. The gasket should be removed with the front panel assembly. Connector J3 of the front panel assembly automatically disengages from connector P303 of the cover assembly (fig. 20).

b. Replacement.

(1) Check to see that the gasket is in place on the front panel assembly.

(2) Position the receiver so that J3 will engage with P303 of the cover assembly.

(3) Slide the receiver into the cover assembly. Connector J3 of the receiver automatically engages with P303 of the cover assembly.

(4) Tighten the six captive screws located on the front panel.

51. Removal and Replacement of Power Supply PP-1481/PRR

a. To remove Power Supply PP-1481/PRR from the receiver, proceed as follows:

(1) Remove the receiver from the cover assembly (para 50*a*).

(2) Remove the screw and washer that secure connector P301 of the cover assembly to J301 of the power supply (fig. 20).

(3) Disconnect P301 of the cover assembly from J301 of the power supply.

(4) Loosen the two captive screws recessed in the power supply.

(5) Lift the power supply from the cover assembly.

b. To replace Power Supply PP-1481/PRR in the receiver, proceed as follows:

(1) Lower the power supply into the recessed center of the cover assembly.

(2) Tighten the two captive screws recessed in the power supply.

(3) Connect P301 of the cover assembly to J301 of the power supply.

(4) Replace the screw and washer that secure P301 of the cover assembly to J301 of the power supply.

(5) Check fuse F301 in the power supply.

(6) Replace the receiver in the cover assembly (para 50*b*).

52. Removal and Replacement of Power Supply Parts

(fig. 28 and 29)

The general parts replacement techniques described in paragraph 49 should be observed when replacing power supply components. The following instructions apply specifically to the replacement of components located on the printed circuit board in the power supply.

Caution: **Do not use a soldering iron larger than 25 watts to remove or replace components located on the printed circuit board.**

a. Remove the printed circuit board from the power supply as described below.

(1) Remove the power supply from the cover assembly (para 51*a*).

(2) Remove the four screws that secure the cover to the power supply frame and remove the cover.

(3) Remove the three screws that secure the printed circuit board to the power supply chassis.

(4) Unsolder the connection from capacitor C301 to the ground lug located on the power supply chassis.

(5) Slide the printed circuit board from the power supply; be careful not to put a strain on the connections of the leads to the printed circuit board.
(6) Unsolder, tag, and label each of the 11 leads connected to the terminals on the printed circuit board.
(7) Remove the printed circuit board from the power supply.

b. To remove a defective part from the the printed circuit board, proceed as follows:
(1) Cut the leads of the defective part as close to the printed circuit board as possible.
(2) Touch the tip of the soldering iron to the mounting hole until the solder is melted, and then remove the old leads.

Caution: Do not allow the soldering iron to make contact with any adjacent components; do not apply heat any longer than necessary.

(3) Melt and remove the excess solder around the mounting holes.

c. To replace a part on the printed circuit board, proceed as follows:
(1) Shape the leads of the replacement part to fit the mounting holes.
(2) Insert the leads in the mounting holes and crimp them to hold the part flat against the printed circuit board.
(3) Cut the leads of the replacement part so that the crimped portion of the leads is about 1/8-inch long.
(4) Use a toothpick or a matchstick to apply a small amount of noncorrosive soldering flux to the mounting holes.
(5) Bend the crimped portion of the leads flat against the conducting surface.
(6) Tin the tip of the soldering iron.
(7) Apply the tip of the soldering iron just long enough for solder to flow onto the mounting holes.

d. To replace the printed circuit board in the power supply, follow the procedures given below:
(1) Position the printed circuit board in the power supply so that a lead from capacitor C301 is in position to be soldered to the ground lug on the power supply chassis.
(2) Remove the tag and solder each lead to the printed circuit board.
(3) Slide the printed circuit board into the power supply so that there is no strain on the connections of the leads.
(4) Solder the lead from capacitor C301 to the ground lug.
(5) Fasten the printed circuit board to the power supply frame with the three screws.
(6) Position the cover on the power supply frame and replace the four mounting screws.
(7) Replace the power supply in the cover assembly (para 51*b*).

53. Removal and Replacement of Combined Rf Tuner and Amplifier Assemblies (fig. 22)

a. To remove the combined rf tuner and amplifier assemblies, proceed as follows:
(1) Remove the receiver from the cover assembly (para 50*a*).
(2) Remove the pluck-out spacer gasket and U206 from the amplifier assembly.
(3) Disconnect P2 from J102.
(4) Remove the screw that secures P4 to J104 and disconnect P4 and J104.
(5) Remove the screw that secures P1 to J201.
(6) Position the receiver with the front panel facing up and remove the center screw from the TUNING knob, loosen the Allen-head setscrew, and remove the TUNING knob.
(7) Remove the center screw from the DIAL LOCK knob and remove the knob.
(8) Loosen the Allen-head setscrew in the CAL ADJ knob and remove the knob.
(9) Remove the 10 screws that fasten the rf tuner assembly to the front panel assembly.

Note. Access to the wiring of the sockets in the rf tuning assembly may be gained by removing the 12 screws in the rear cover plate and removing the plate.

b. To replace the combined rf tuner and amplifier assemblies, proceed as follows:

(1) Position the front panel over the mounting holes in the rf tuner assembly and replace the 10 screws.
(2) Replace the CAL ADJ knob on its shaft and tighten the Allen-head setscrew.
(3) Place the DIAL LOCK knob on the dial lock shaft. The tuning drive shaft should lock when the DIAL LOCK is turned clockwise.
(4) Replace the center screw in the DIAL LOCK knob.
(5) Replace the tuning knob, the center screw, and tighten the Allen-head setscrew.
(6) Position the receiver with the front panel facing downward.
(7) Connect P1 to J201 and replace the securing screw.
(8) Connect P4 and J104 and replace the securing screw.
(9) Connect P2 to J102.
(10) Replace U206 and the spacer gasket in the amplifier assembly (para 34).
(11) Replace the receiver in the cover assembly (para 50*b*).

54. Removal and Replacement of Amplifier Assembly
(fig. 22)

To remove the amplifier assembly from the receiver, follow the procedures outlined below.

a. Removal.

(1) Remove the receiver from the cover assembly (para 50*b*).
(2) Remove the pluck-out spacer gasket and U206.
(3) Disconnect plug P2 from J102.
(4) Disconnect P101 from J101.
(5) Disconnect P104 from J203.
(6) Remove the four screws that secure the amplifier assembly to the rf tuner assembly and remove the amplifier assembly.
(7) Remove the screw that secures P1 to J201 and disconnect P1 from J201.
(8) Disconnect P102 from J202.

Note. To gain access to the socket wiring of the amplifier assembly, remove the six screws that secure the bottom cover plate to the amplifier assembly and remove the bottom cover plate.

b. Replacement.

(1) Connect J102 to J202.
(2) Connect P1 to J201 and replace the screw that secures P1 to J201.
(3) Position the amplifier assembly over the four mounting holes in the rf tuner assembly and replace the four screws.
(4) Connect P104 to J203.
(5) Connect P101 to J101.
(6) Connect P2 to J102.
(7) Replace U206 and the pluck-out spacer gasket (para 34).
(8) Replace the receiver in the cover assembly (para 50*b*).

55. Lubrication

The only components that require lubrication at organizational level are the bevel gears in the rf tuning assembly. These gears are exposed when the receiver is removed from the cover assembly. (fig. 31). Lubricate the bevel gears with Grease, Aircraft and Instrument MIL-G-3278. Spread a small amount of grease over the gear teeth. Wipe off the excess grease; do not overlubricate. Lubrication of the bevel gears should be performed when repairs are made in the rf tuning assembly.

Section II. ALIGNMENT

56. Alignment Instructions

a. General. Alignment of the receiver should not be performed unless the test procedures fail to correct the improper performance and definitely indicate that realignment is necessary. The alignment

procedure is divided into two parts: rf and mixer alignment and local oscillator alignment. The pluck-out units of the if. stages are aligned and sealed at the factory, and do not require realignment. The necessary receiver preparations for alignment are described in *b* below.

b. Receiver Preparation. The test equipment hookup is slightly different for each alignment operation, and is described in the explanatory information which precedes each test procedure. To provide access to test point J105 (fig. 2), it is necessary to remove the receiver from the cover assembly. Receiver operating voltages must be supplied from either the internal batteries, the internal power supply, or an alternative external source. To prepare the receiver for alignment, perform the following steps:

(1) Remove the receiver from the cover assembly (para 50*a*).

(2) Remove the rear cover plate from the rf tuner assembly (fig. 22).

(3) Connect the provided test cable between J3 and P303 (fig. 20).

(4) Connect the test setup power source (para 37).

(5) Turn the POWER switch to the BATT or VEH position, as appropriate.

57. Test Equipment Required for Alignment

The following test equipment is required for alignment of Receiver, Radio R-744/PRR:

Item	Technical manual
Signal Generator TS-497/URR	TM 11-5030
Multimeter ME-26A/U	TM 11-6625-200-12

58. Rf and Mixer Alignment

Prepare the receiver for alignment as described in paragraph 56*b*. Connect the am. signal generator to ANT receptacle J1. Connect the vtvm to test point J105 (fig. 2) through a shielded cable and set it up to measure ac voltages. Proceed as follows:

a. Connect the headset to AUDIO jack J5.

b. To adjust the am. signal generator and receiver to 20 mc, use the following procedures:

(1) Turn the OPERATE switch to the CAL position.

(2) Turn the antenna selector switch to the DF ANT position.

(3) Center-adjust the CAL ADJ control

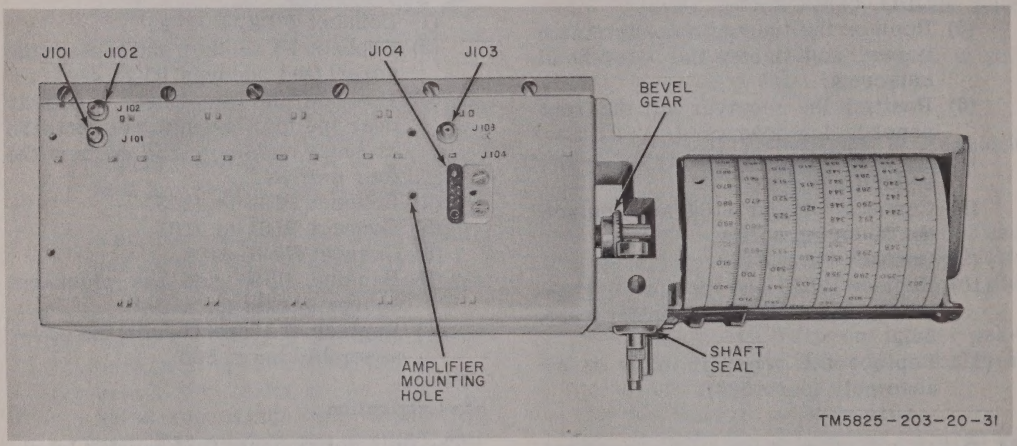


Figure 31: Rf tuner assembly, bottom view.

by rotating it as far as possible in either direction, and then backing off 7-3/4 turns.

(4) Rotate the TUNING control for zero beat with the calibration signal closest to the dial indication of 20 megacycles. Do not turn the CAL ADJ control. (The zero beat indication is a silent null between two audio tones.)

(5) Turn the antenna switch to the ANT position.

(6) Turn the OPERATE switch to the CW position.

(7) Adjust the am. signal generator to produce a cw signal of 20 megacycles.

(8) If necessary, adjust the am. signal generator frequency slightly to provide a zero beat in the headset.

(9) Disconnect P104 from J203 (fig. 22).

(10) Modulate the am. signal generator output signal 30 percent at 1,000 cps.

(11) Set the am. signal generator amplitude control for an output of 100 microvolts.

(12) Set the TUNING control to 20 megacycles.

c. Adjust the trimmer capacitors C105, C110, C117, and C125 on the rf tuner assembly (fig. 2) for a maximum indication on the vtvm. Repeat this operation at least once. If necessary, adjust the amplitude of the input signal to provide a convenient indication on the vtvm.

d. Connect P104 to J203 (fig. 22).

e. To adjust the receiver and am. signal generator to 100 mc, use the following procedures:

(1) Turn the OPERATE switch to the CAL position.

(2) Turn the antenna selector switch to the DF ANT position.

(3) Rotate the TUNING control for a zero beat with the calibration signal closest to the dial indication of 100 mc. Do not turn the CAL ADJ control.

(4) Turn the antenna selector switch to the ANT position.

(5) Turn the OPERATE switch to the CW position.

(6) Adjust the am. signal generator to produce a cw signal of 100 mc.

(7) If necessary, adjust the am. signal generator frequency slightly to provide a zero beat in the headset.

(8) Modulate the am. signal generator output 30 percent at 1,000 cps.

(9) Set the am. signal generator amplitude control for an output level of 100 microvolts.

(10) Set the receiver TUNING control to 100 mc.

f. Adjust coils L103, L108, L113, and L118 (fig. 25(1)) for a maximum indication on the vtvm. (Adjustment of the screwdriver control alters the position of the shorting strip on these inductors, thereby varying the inductance). If necessary, adjust the amplitude of the input signal for a convenient indication on the output meter.

g. Disconnect P104 and J203 (fig. 22).

h. Repeat *b* (1), (2), (4), (5), (6), (7), (8) (10) and (11) above.

i. Rotate the TUNING control for maximum audio output.

j. Adjust transformer T101 (fig. 25(1)) for maximum audio output.

k. Repeat procedures *d* through *f* above.

l. Connect P104 and J203 (fig. 22).

59. Local Oscillator Alignment

Prepare the receiver for alignment as described in paragraph 56*b*. Connect the am. signal generator to ANT jack J1. Connect the headset to AUDIO jack J5. Perform the following procedure:

a. To set the am. signal generator output frequency to exactly 20 mc, use the following procedures:

(1) Turn the OPERATE switch to the CAL position.

(2) Turn the antenna selector switch to the DF ANT position.

(3) Turn the RF GAIN control one-quarter turn counterclockwise from the extreme clockwise position.

(4) Rotate the TUNING control for a zero beat at the calibration frequency nearest 20 mc on the receiver dial. Do not turn the CAL

ADJ control.

(5) Set the antenna selector to the ANT position.

(6) Set the OPERATE switch to the CW position.

(7) Adjust the am. signal generator to produce a cw signal at 20 mc.

(8) Adjust the am. signal generator frequency slightly, if necessary, for a zero beat in the headset. (The zero beat indication is a silent null point between two audio tones.)

(9) Adjust the am. signal generator for an output of 100 microvolts.

b. Set the TUNING control to 20 mc.

c. Adjust coil L121 (fig. 25①) for a zero beat indication in the headset.

d. To set the am. signal generator output frequency to exactly 100 mc, use the following procedures.

(1) Turn the OPERATE switch to the CAL position.

(2) Turn the antenna selector switch to the DF ANT position.

(3) Adjust the TUNING control for a zero beat at the calibration frequency nearest 100 mc on the receiver dial. Do not turn the CAL ADJ control.

(4) Set the antenna selector to the ANT position.

(5) Set the OPERATE switch to the CW position.

(6) Adjust the am. signal generator to produce a cw signal at 100 mc.

(7) Adjust the am. signal generator frequency slightly, if necessary, for zero beat in the headset.

(8) Adjust the am. signal generator for an output of 100 microvolts.

e. Set theTUNING control to 100 mc.

f. Adjust coil L123 (fig. 25①) to obtain a zero beat indication in the headset.

g. To set the am. signal generator output frequency to exactly 60 mc, use the following procedures.

(1) Turn the OPERATE switch to the CAL position.

(2) Turn the antenna selector switch to the DF ANT position.

(3) Adjust the tuning control for a zero beat at the calibration frequency nearest 60 mc on the receiver dial.

(4) Set the antenna selector to the ANT position.

(5) Set the OPERATE switch to the CW position.

(6) Adjust the am. signal generator to produce a cw signal at 60 mc.

(7) Adjust the am. signal generator frequency slightly, if necessary, for zero beat in the headset.

(8) Adjust the signal generator for an output of 100 microvolts.

h. Set the TUNING control at 60 mc.

i. Adjust capacitor C137 (fig. 2) for a zero beat indication in the headset.

j. Repeat procedures *a* through *i* above until the receiver frequency setting corresponds within 10 kc of the signal frequency at the three checkpoints.

CHAPTER 7
SHIPMENT AND LIMITED STORAGE

60. Disassembly of Equipment

Disassembly procedures for vehicular installation vary somewhat from those for portable installations. The following disassembly procedure provides for the disassembly of the receiver group for both types of installations. In following these instructions, comply only with the procedural directions appropriate to the particular installation. For disassembly procedures pertaining to the antennas, refer to the instructions issued with the antenna group.

a. Cables.

(1) Disconnect the antenna lead-in cables from the DF ANT and ANT receptacles.

(2) Disconnect the power cable from the VEH POWER receptacle and vehicular storage battery. Remove, as necessary, all cable straps that secure the cable to the vehicle.

(3) Disconnect the headset from the AUDIO output jack.

(4) Clean all cables and connectors. Coil and store the antenna cables in accordance with the instructions supplied with the antenna equipment. Coil and store the power cable in its compartment in the canvas field pack.

b. Receiver, Radio R-744/PRR.

(1) If the receiver is installed on the mounting base, remove it from the mounting base by backing off the two screw clamps (fig. 3) which clamp the receiver to the base.

(2) Check to see that the POWER switch and the LITE DIM control are set to OFF, and that the DIAL LOCK is locked. Turn the AF GAIN and RF GAIN controls to maximum counterclockwise position.

(3) Replace the caps on the ANT and DF ANT receptacles.

(4) Cover the VEH POWER and AUDIO receptacles with paper, held in place by masking tape.

(5) Clean all threaded sections of the receptacles and the receptacle protective caps and apply a light protective coating of grease to these parts.

(6) Return the receiver to its compartment in the canvas field pack.

c. Mounting Base.

(1) Unbolt the mounting base from the vehicular platform.

(2) Clean the mounting base. Clean and coat lightly with grease all screw clamps and attaching hardware.

(3) Return the mounting hardware to bag and attach to the mounting base.

(4) Return the mounting base to its compartment in the canvas field pack.

d. Power Supply PP-1481/PRR. The power supply is shipped installed in the receiver and is not disassembled.

e. Internal Batteries. Disconnect and remove the A- and B-batteries. Battery removal is described in TM 11-5825-203-10. Place the batteries in the accessory field pack.

f. Headset. Store the headset in the compartment provided in the receiver canvas field pack. Avoid kinking the headset cable or crushing the protective earcaps (if provided).

g. Spare Parts Kit. Check the spare parts kit for completeness and proper nesting. Return the spare parts kit to the accessory canvas field pack.

61. Repacking for Shipment or Limited Storage

The exact procedure for repackaging depends on the material available and the conditions under which the equipment is

to be shipped or stored. Adapt the procedures outlined below whenever possible. The information concerning the original packaging (para 3) will also be helpful. If the original shipping material is available, use it.

a. Material Requirements. The following materials are required for packaging Receiver Group OA-1451/PRR. For stock numbers of materials, consult SB 38-100.

Material	Quantity
Waterproof paper	20 sq ft
Waterproof tape	10 ft
Cotton twine	20 ft
Corrugated cardboard	7 sq ft
Adhesive tape	10 ft
Flat steel strapping	12 ft

b. Packaging. The two canvas field packs (in which all receiver group components are packed) are packaged as outlined below.

(1) Fill the spaces in the field pack with pads to prevent movement. Cushion each canvas field pack on all sufaces with pads of corrugated cardboard. Secure the pads with gummed tape.

(2) Place each cushioned package within a close-fitting, water-resistant, fiberboard carton and secure with tape. Identify the carton.

(3) Place both cartons in a well-fitting outer carton which has been lined with waterproof paper. Secure the waterproof barriers and carton with waterproof tape. Mark the carton in accordance with MIL-STD-129.

c. Packing. If the original packing case is not available, construct a wooden packing case similar to the original case (para 3).

(1) Line the wooden packing case with waterproof paper (fig. 1).

(2) Place the outer carton containing separately packaged components in the packing case.

(3) Fill the spaces with filler to prevent movement.

(4) Close and seal the waterproof barrier with waterproof tape.

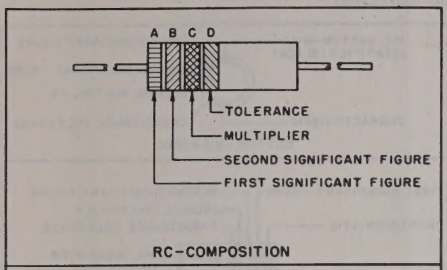
(5) Place the packing case top in position and nail.

(6) Apply two bands of metal strapping around the packing case if intertheater shipment is intended.

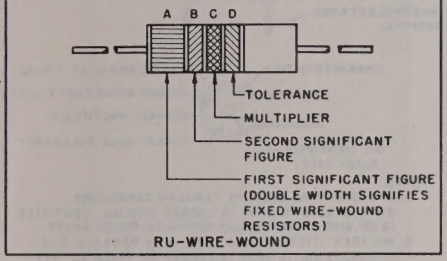
(7) Mark the packing case in accordance with MIL-STD-129.

RESISTOR COLOR CODE MARKING
(MIL-STD RESISTORS)

AXIAL-LEAD RESISTORS (INSULATED)

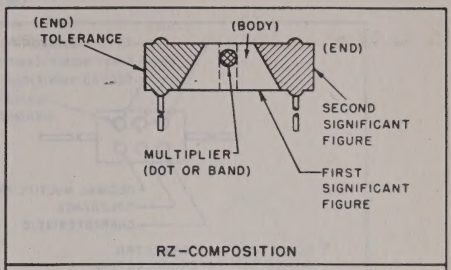


RC-COMPOSITION

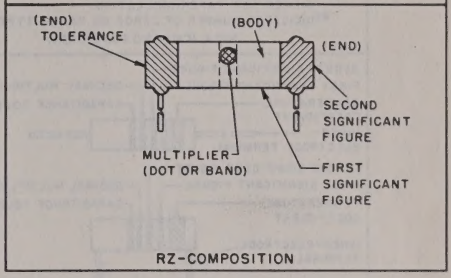


RU-WIRE-WOUND

RADIAL-LEAD RESISTORS (UNINSULATED)



RZ-COMPOSITION



RZ-COMPOSITION

RESISTOR COLOR CODE

BAND A OR BODY*		BAND B OR END*		BAND C OR DOT OR BAND*		BAND D OR END*	
COLOR	FIRST SIGNIFICANT FIGURE	COLOR	SECOND SIGNIFICANT FIGURE	COLOR	MULTIPLIER	COLOR	RESISTANCE TOLERANCE (PERCENT)
BLACK	0	BLACK	0	BLACK	1	BODY	± 20
BROWN	1	BROWN	1	BROWN	10	SILVER	± 10
RED	2	RED	2	RED	100	GOLD	± 5
ORANGE	3	ORANGE	3	ORANGE	1,000		
YELLOW	4	YELLOW	4	YELLOW	10,000		
GREEN	5	GREEN	5	GREEN	100,000		
BLUE	6	BLUE	6	BLUE	1,000,000		
PURPLE (VIOLET)	7	PURPLE (VIOLET)	7				
GRAY	8	GRAY	8	GOLD	0.1		
WHITE	9	WHITE	9	SILVER	0.01		

*FOR WIRE-WOUND-TYPE RESISTORS, BAND A SHALL BE DOUBLE-WIDTH. WHEN BODY COLOR IS THE SAME AS THE DOT (OR BAND) OR END COLOR, THE COLORS ARE DIFFERENTIATED BY SHADE, GLOSS, OR OTHER MEANS.

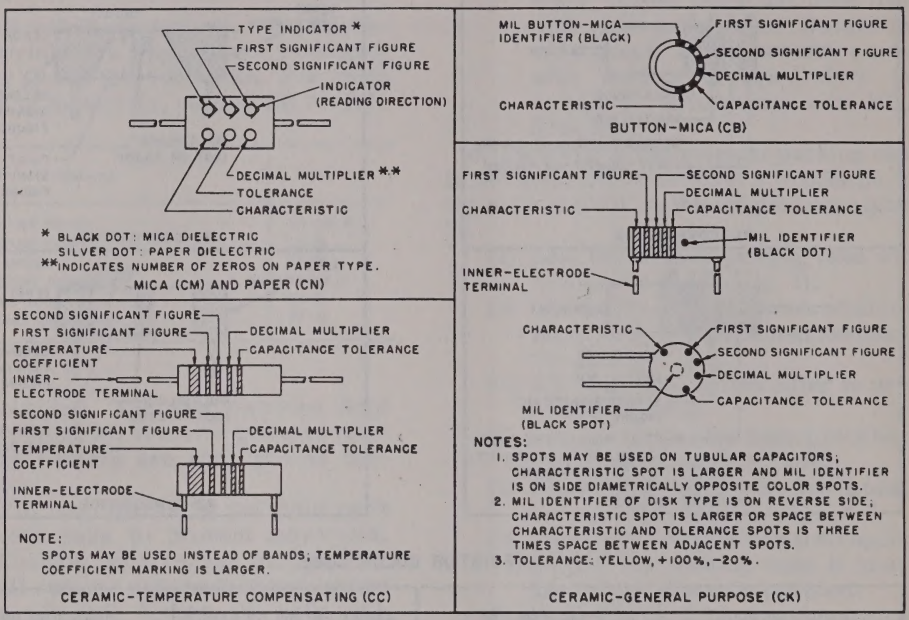
EXAMPLES (BAND MARKING):
10 OHMS ±20 PERCENT: BROWN BAND A; BLACK BAND B; BLACK BAND C; NO BAND D.
4.7 OHMS ±5 PERCENT: YELLOW BAND A; PURPLE BAND B; GOLD BAND C; GOLD BAND D.

EXAMPLES (BODY MARKING):
10 OHMS ±20 PERCENT: BROWN BODY; BLACK END; BLACK DOT OR BAND; BODY COLOR ON TOLERANCE END.
3,000 OHMS ±10 PERCENT: ORANGE BODY, BLACK END; RED DOT OR BAND; SILVER END.

STD-RI

Figure 32. MIL-STD resistor color code markings.

CAPACITOR COLOR CODE MARKING
(MIL-STD CAPACITORS)



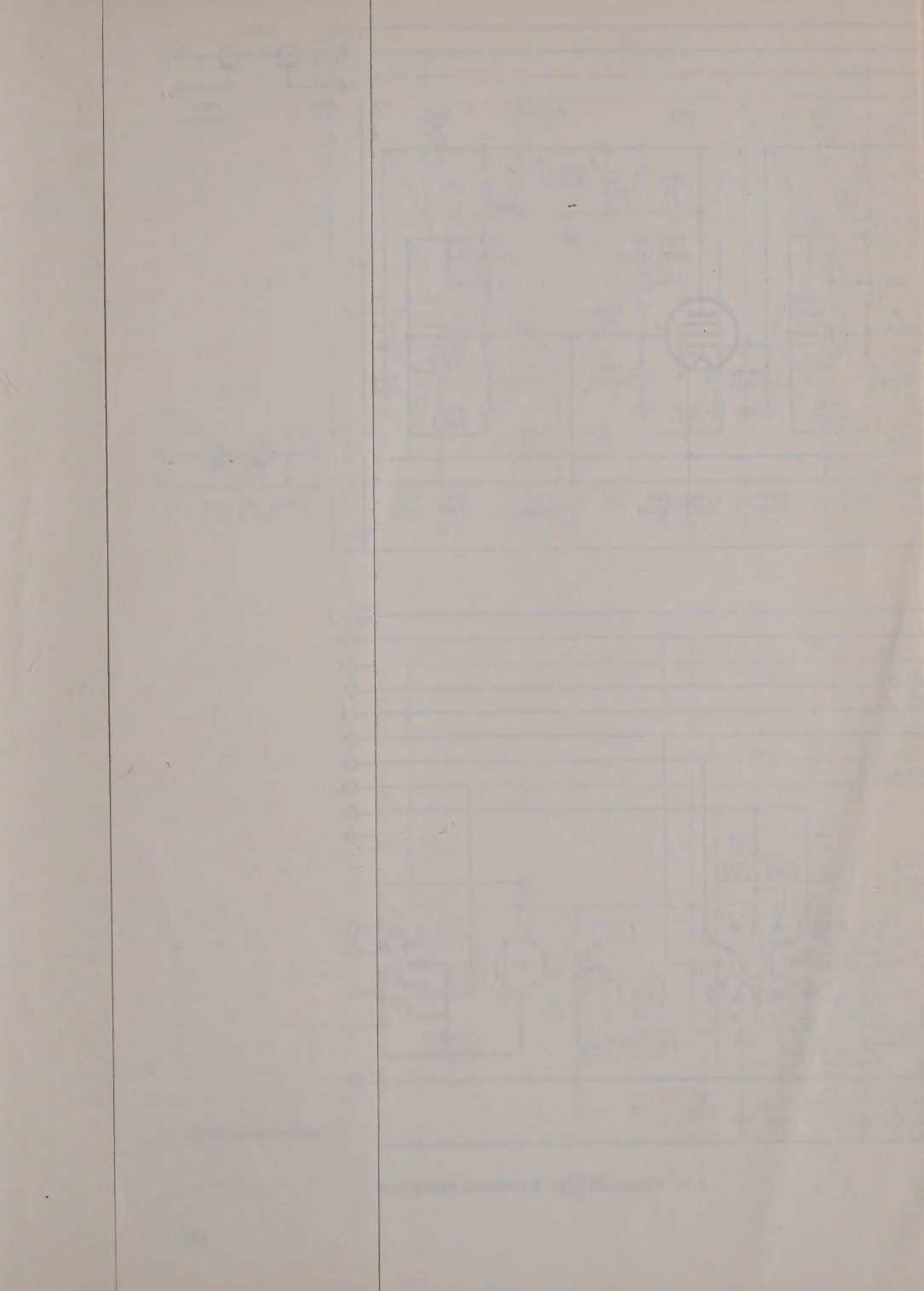
CAPACITOR COLOR CODE

COLOR	SIG FIG.	MULTIPLIER		CHARACTERISTIC[1]				TOLERANCE[2]					TEMPERATURE COEFFICIENT (UUF/UF/°C)
		DECIMAL	NUMBER OF ZEROS	CM	CN	CB	CK	CM	CN	CB	CC		
											OVER 10UUF	10UUF OR LESS	CC
BLACK	0	1	NONE		A			20	20	20	20	2	ZERO
BROWN	1	10	1	B	E	B	W				1		-30
RED	2	100	2	C	H		X	2		2	2		-80
ORANGE	3	1,000	3	D	J	D			30				-150
YELLOW	4	10,000	4	E	P								-220
GREEN	5		5	F	R						5	0.5	-330
BLUE	6		6		S								-470
PURPLE (VIOLET)	7		7		T	W							-750
GRAY	8		8			X						0.25	+30
WHITE	9		9								10	1	-330(±500)[3]
GOLD		0.1						5		5			+100
SILVER		0.01						10	10	10			

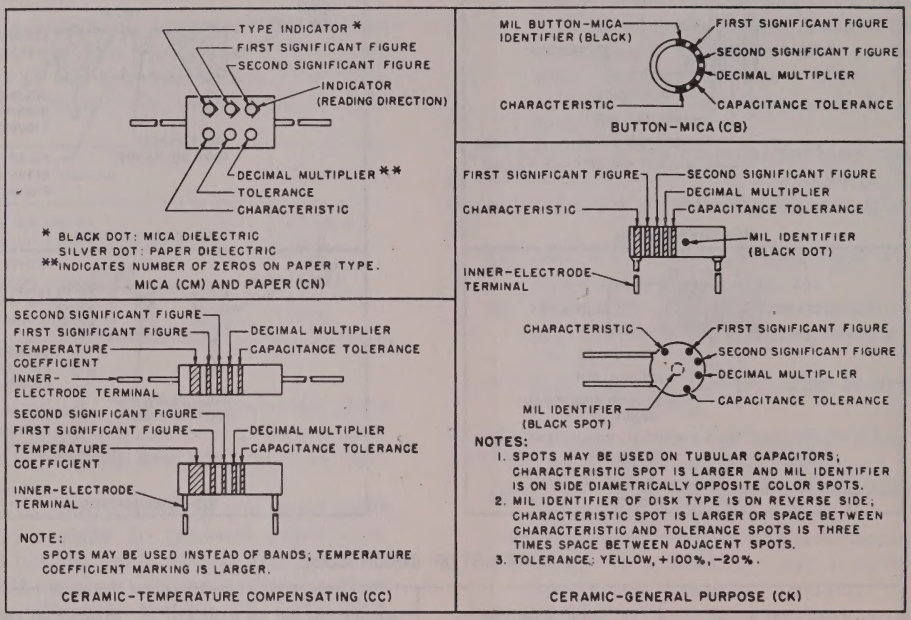
1. LETTERS ARE IN TYPE DESIGNATIONS GIVEN IN MIL-C SPECIFICATIONS.
2. IN PERCENT, EXCEPT IN UUF FOR CC-TYPE CAPACITORS OF 10 UUF OR LESS.
3. INTENDED FOR USE IN CIRCUITS NOT REQUIRING COMPENSATION.

STD-CI

Figure 33. MIL-STD capacitor color code markings.



CAPACITOR COLOR CODE MARKING
(MIL-STD CAPACITORS)



CAPACITOR COLOR CODE

COLOR	SIG FIG.	MULTIPLIER		CHARACTERISTIC[1]				TOLERANCE [2]					TEMPERATURE COEFFICIENT (UUF/UF/°C)
		DECIMAL	NUMBER OF ZEROS	CM	CN	CB	CK	CM	CN	CB	CC		
											OVER 10UUF	10UUF OR LESS	CC
BLACK	0	1	NONE		A			20	20	20	20	2	ZERO
BROWN	1	10	1	B	E	B	W				1		-30
RED	2	100	2	C	H		X	2		2	2		-80
ORANGE	3	1,000	3	D	J	D			30				-150
YELLOW	4	10,000	4	E	P								-220
GREEN	5		5	F	R						5	0.5	-330
BLUE	6		6		S								-470
PURPLE (VIOLET)	7		7		T	W							-750
GRAY	8		8			X						0.25	+30
WHITE	9		9								10	1	-330(±500) [3]
GOLD		0.1						5		5			+100
SILVER		0.01						10	10	10			

1. LETTERS ARE IN TYPE DESIGNATIONS GIVEN IN MIL-C SPECIFICATIONS.
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STD-C1

Figure 33. MIL-STD capacitor color code markings.

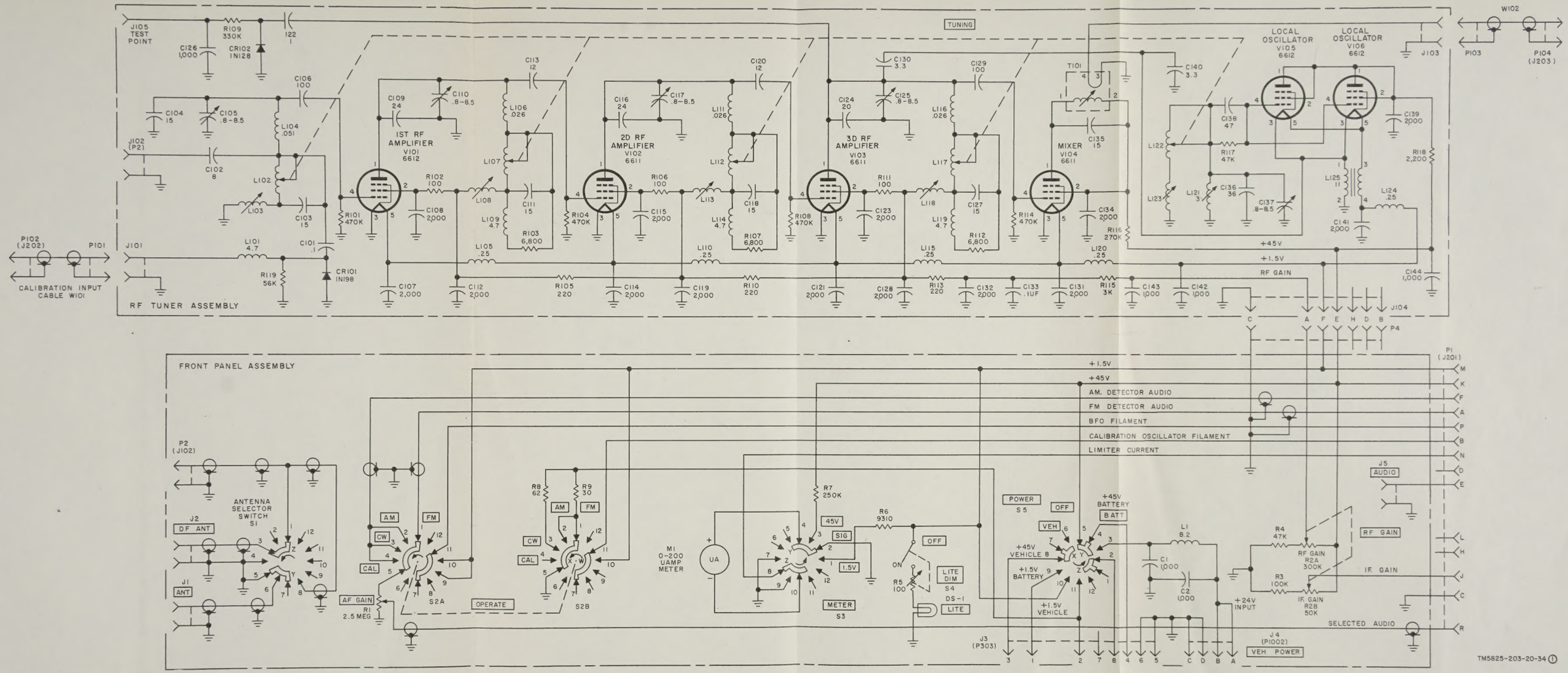
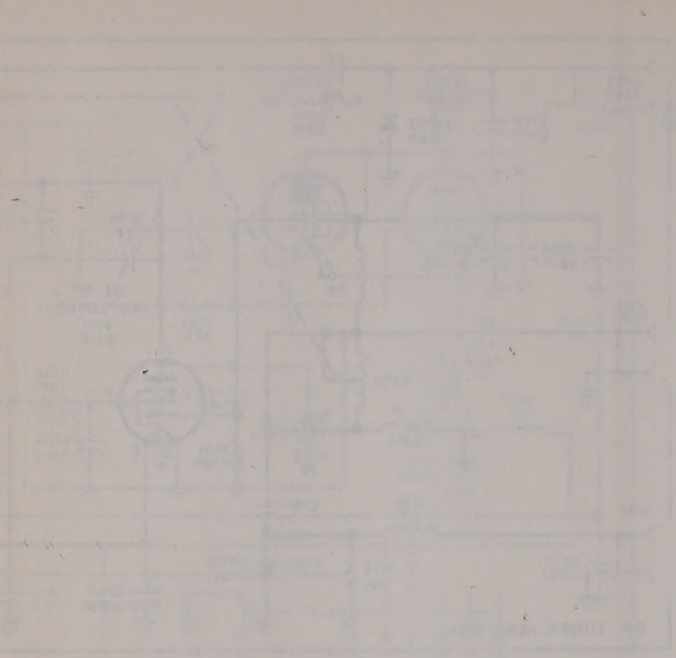
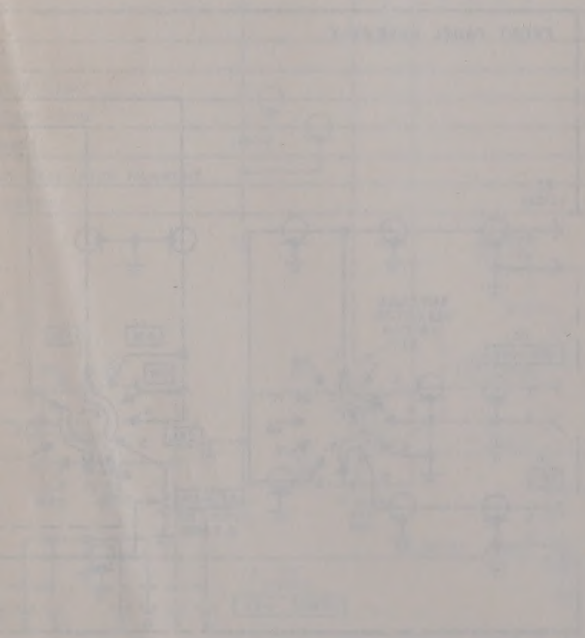
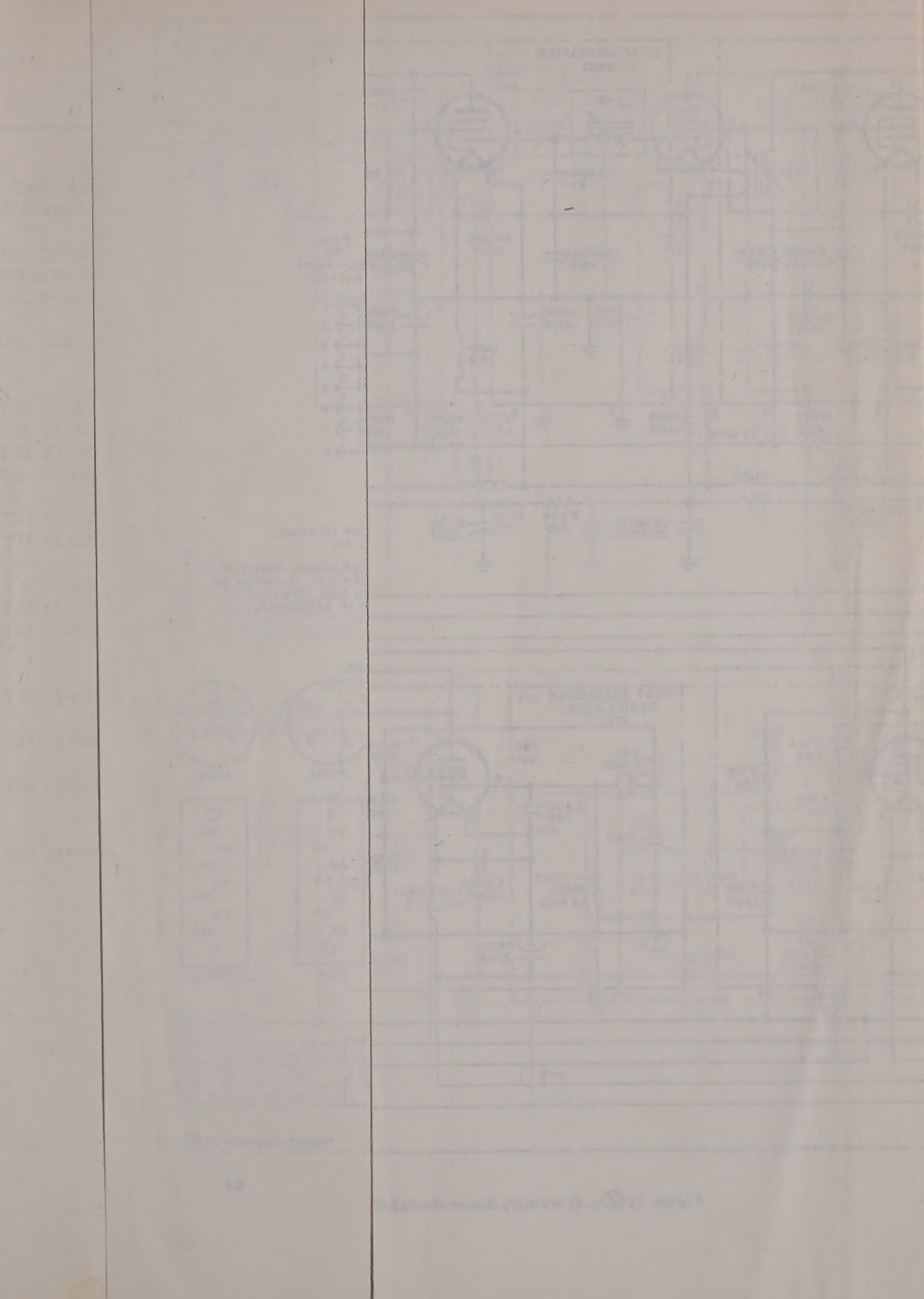
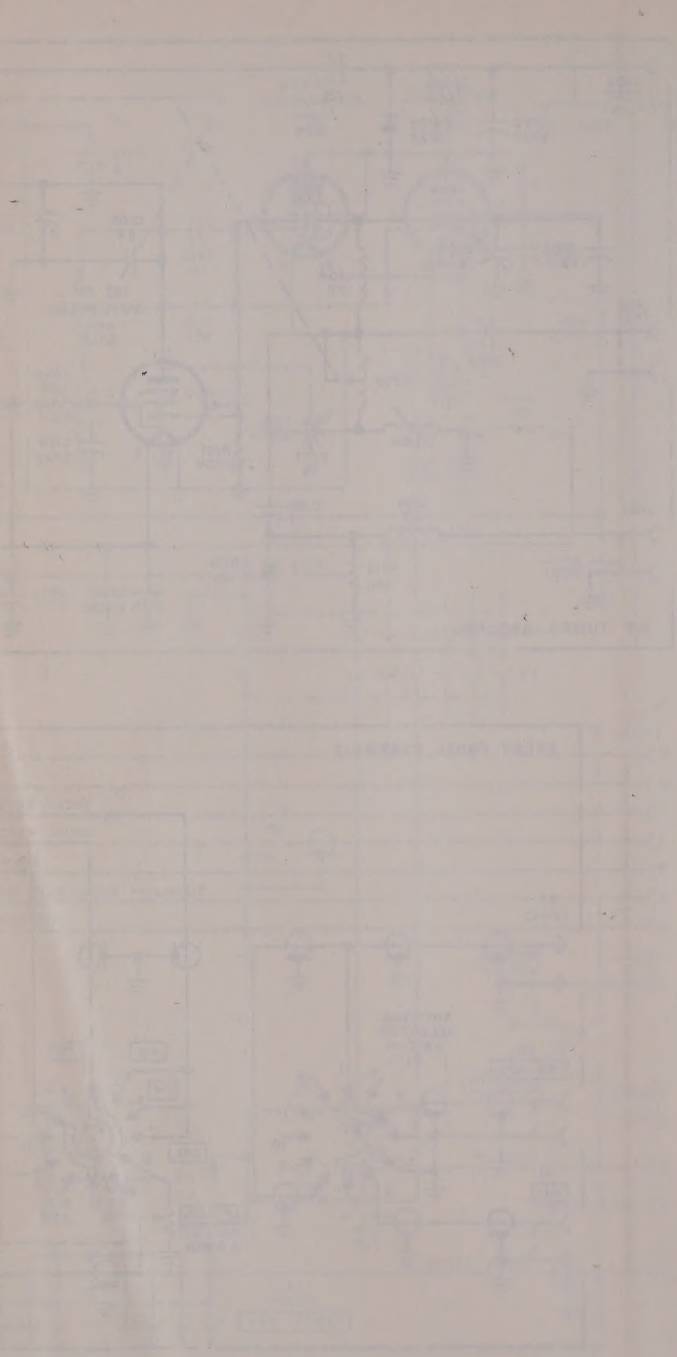


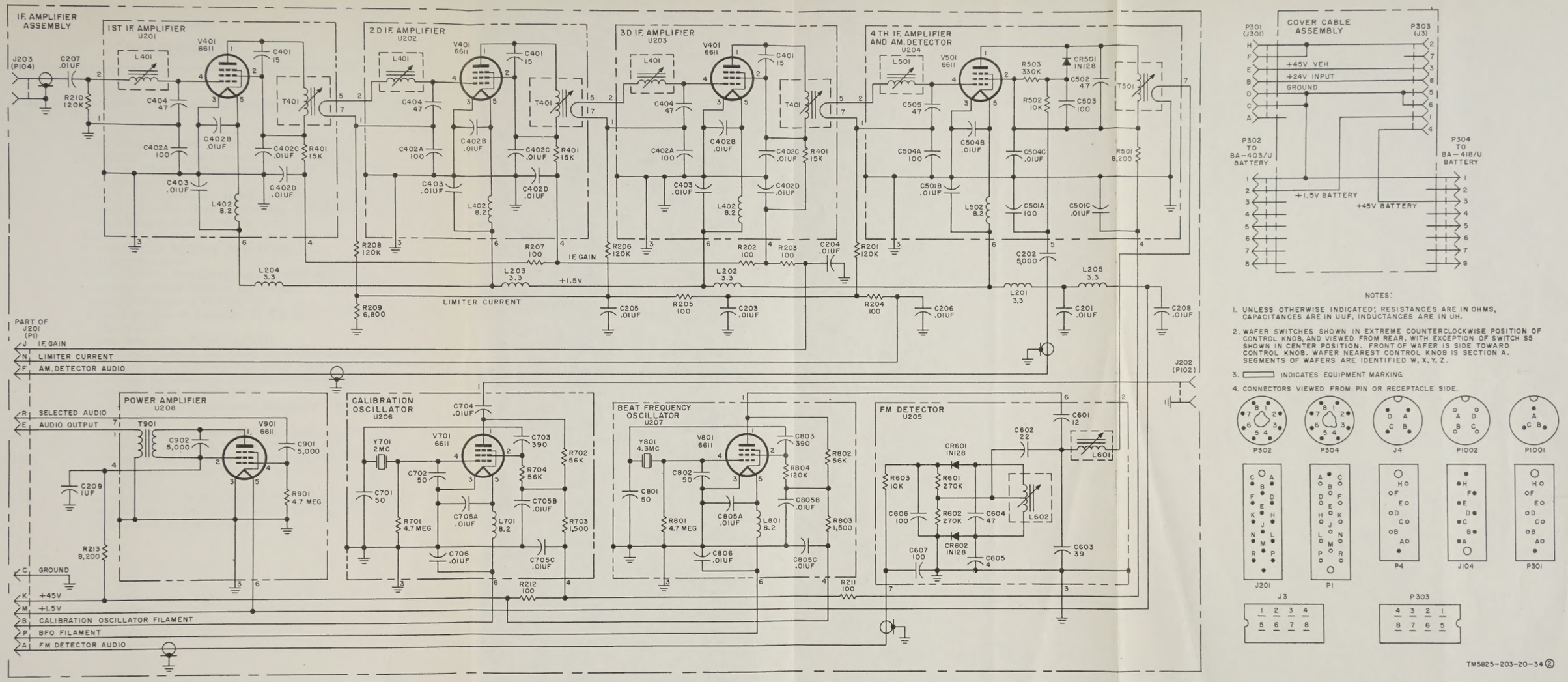
Figure 34 (1). Receiver, Radio R-744/PRR, schematic diagram (part 1 of 2).









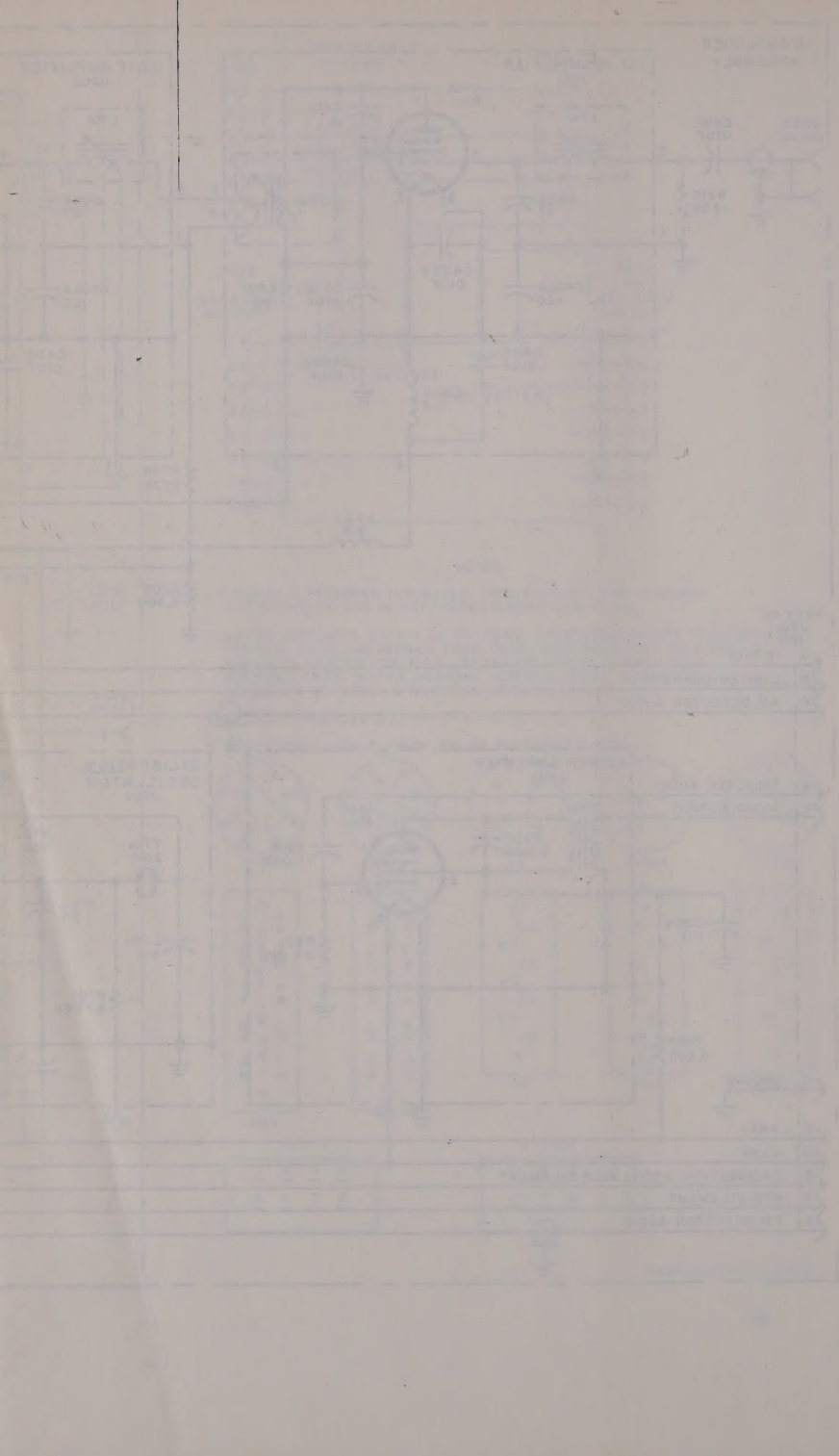


NOTES:

1. UNLESS OTHERWISE INDICATED; RESISTANCES ARE IN OHMS, CAPACITANCES ARE IN UUF, INDUCTANCES ARE IN UH.
2. WAFER SWITCHES SHOWN IN EXTREME COUNTERCLOCKWISE POSITION OF CONTROL KNOB, AND VIEWED FROM REAR, WITH EXCEPTION OF SWITCH S5 SHOWN IN CENTER POSITION. FRONT OF WAFER IS SIDE TOWARD CONTROL KNOB. WAFER NEAREST CONTROL KNOB IS SECTION A. SEGMENTS OF WAFERS ARE IDENTIFIED W, X, Y, Z.
3. ▭ INDICATES EQUIPMENT MARKING.
4. CONNECTORS VIEWED FROM PIN OR RECEPTACLE SIDE.

TM5825-203-20-34 (2)

Figure 34 (2). Receiver, Radio R-744/PRR, schematic diagram (part 2 of 2).



APPENDIX
REFERENCES

Following is a list of references applicable and available to the unit repairman of Receiver Group OA-1451/PRR:

AR 320-5	Dictionary of United States Army Terms.
AR 320-50	Authorized Abbreviations and Brevity Codes.
DA Pam 108-1	Index of Army Motion Pictures, Film Strips, Slides and Phonorecordings.
DA Pam 310-4	Military Publications: Index of Technical Manuals, Technical Bulletins, Supply Bulletins, Lubrication Orders, and Modification Work Orders.
FM 21-5	Military Training.
FM 21-6	Techniques of Military Instruction.
FM 21-30	Military Symbols.
SB 38-100	Preservation, Packaging, and Packing Materials, Supplies, and Equipment Used by the Army.
TM 11-1257	Signal Generator AN/URM-48.
TM 11-2684A	Audio Oscillators TS-382A/U, TS-382B/U, TS-382D/U, and TS-382E/U.
TM 11-5030	Signal Generator TS-497A/URR.
TM 11-5825-203-10	Operator's Manual, Receiver Group OA-1451/PRR.
TM 11-5825-203-20P	Organizational Maintenance Repair Parts and Special Tools List and Maintenance Allocation Chart: Receiver Group OA-1451/PRR (XE-3)/PRR.
TM 11-6625-200-12	Operation and Organizational Maintenance: Multimeter ME-26B/U.
TM 11-6625-203-12	Operation and Organizational Maintenance: Multimeter AN/URM-105, including Multimeter ME-77/U.
TM 11-6625-274-12	Operator's and Organizational Maintenance Manual: Test Sets, Electron Tube TV-7/U, TV-7A/U, TV-7B/U, and TV-7D/U.
TM 11-6625-320-12	Operator's and Organizational Maintenance Manual: Voltmeter, Meter ME-30A/U and Voltmeters, Electronic ME-30B/U and ME-30C/U.

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